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The Outlook

For the Want of a Nail . . .

ACROSS the ocean our ability to make characteristic understatements and the lack of British publicity have, on occasion, invited some ridicule and even a degree of distrust on suspect of deep, dark motives. Certainly it is a rare occasion when anxiety to further the cause of British aviation can be the subject of mild criticism, but whether due to events too hurriedly planned, a little premature or simply unlucky, the Tudor pressure incident and the regrettable loss of the Wayfarer are most unfortunate.

The story of Lord Winster's "escape" while flying in a pressurized Tudor I has been exaggerated beyond recognition by some of the sensational Press, and the attitude of the Minister and his party after landing was rather one of "what's all the fuss about?" A very minor defect in the pressure equipment caused some smoke in the cabin and the pilot very rightly decided to land and find out the reason. Nevertheless, the makers' statement that the defect had been located and that a modification will be incorporated on all aircraft being built seems strange at this stage, particularly as a similar incident occurred some weeks ago. Snags of this kind should be eliminated before the Minister of Civil Aviation publicly samples air travel in British aircraft soon to equip our airlines.

Much more unfortunate in many ways is the ditching of the Wayfarer while on its way to Rio and Buenos Aires for demonstration. In this case the reflection is not at all on the aircraft, which flew much farther than was required of it and, incidentally, floated for a long period after it might reasonably have been expected to sink. No amount of explanation about navigation troubles will entirely dissociate the good name of the aircraft from this incident in the minds of important potential overseas customers. There can be little excuse for navigational errors in these days when there is such a choice of equipment and methods.

And so two well-intentioned enterprises came near to doing quite serious harm to our prestige through mishaps which in themselves were relatively unimportant and should have been avoidable.

This sort of thing has happened before and we are not alone in our trouble at the present time. Aircraft equipment does have a way of developing unexpected faults after hundreds of hours of satisfactory operation, and the way is then open for intentional or irresponsible distortion of the facts to do untold harm.

Jet Bombers

IT will be interesting to see if Britain's first medium or large jet aircraft will be a civil or a military type. Pressing as are the demands for transports, our design and development commitments must be continuously scrutinized. Bomber Command, now very reduced in establishment, must soon be armed with more effective machines, capable of facing opposition by massed jet fighters and improved anti-aircraft armament, including guided missiles.

Five new multi-jet bomber prototypes additional to the existing Douglas XB-43 and built by North-American, Consolidated-Vultee, Boeing, Martin and Northrop have been ordered for the U.S. Army Air Forces, but beyond the recent declaration by the Minister of Supply and Aircraft Production that the R.A.F. will in future be interested only in fighters and bombers which have gas turbines, no official pronouncement has been made on new British bomber developments.

Some comfort can be derived, however, from the order for the DH 106 tail-less transport, which is expected to cruise at about 500 m.p.h., and for the 90,000-lb Avro transport with four gas turbines. Projected Armstrong-Whitworth jet-propelled flying wings already illustrated in *Flight* seem equally promising.

Bombers developed along the lines of these machines should be faster and little, if any, more difficult to

develop, although, as remarked in a special article in this issue, armament must be designed into a jet bomber and not in future be regarded as an almost infinitely variable item.

The whole world awaits a crop of new British bombers powered with the unsurpassed gas turbines which our engine firms have made available.

The High Speed Flight

SEVERAL reasons for satisfaction are afforded by the announcement that an R.A.F. High Speed Flight has been formed under the command of Group Capt. E. M. Donaldson, D.S.O., A.F.C., and that two special Gloster Meteors will soon be used for an attack on the World's Air Speed Record, established last November by a similar aircraft flown by Group Capt. H. J. Wilson at 606 m.p.h.

Group Capt. Donaldson tells us that his flight has been established solely with the object of securing the record, which suggests that the Air Ministry, the Ministry of Supply and C.-in-C. Fighter Command appreciate that in these times Britain's prestige in the air counts for more than ever before.

There is little doubt that the Group Captain or one of his pilots will attain a speed very near 630 m.p.h. but even should this figure be recorded the flight will continue to pay for itself in flying the Meteor, and perhaps newer jet fighters, at even greater speeds. Certainly within twelve months the amazing Gloster fighter should fly appreciably faster and will, it is hoped, set even higher marks for Shooting Stars, Thunderjets and other rivals to aim at.

In the High Speed Flight, moreover, we shall have the nucleus of a unit which might be employed specifically for the proving of ultra-fast Service aircraft. Should existing R.A.F. formations be considered adequate for this purpose then the course with its elaborate marking and timing facilities might be preserved, for as the development of fast aircraft proceeds accurate timing and observation will become increasingly important in the attainment of transonic speeds.

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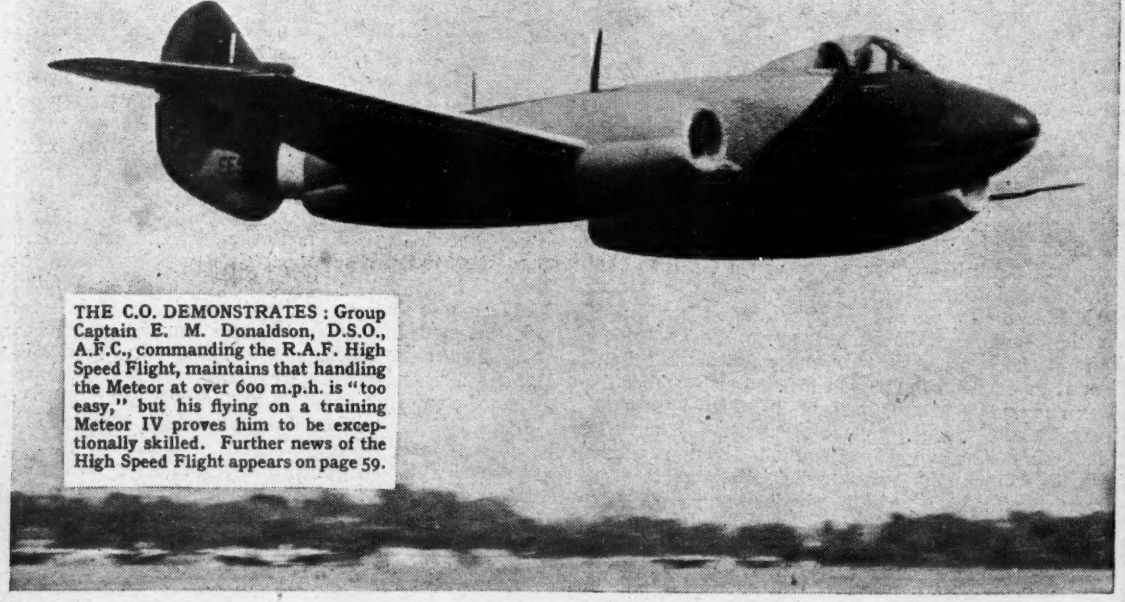
Fait Accompli

UNLESS there are any hold-ups and modifications during its passage through the House of Lords, it would seem that the Civil Aviation Bill is now due to become law. On Thursday of last week the Bill secured its third reading in the House of Commons and went through with a majority of 270 votes to 91. In all common sense, no other result could have been expected, and very soon the time will have come for those of any shade of political or ethical opinion to accept the principle of nationalization as applied to air transport and to do their very best to make it work.

And it *can* be made to work provided that the organization is not allowed to become top-heavy and to suffer from the inefficiencies which seem to be inseparable from any large-scale civil service machine.

It is obviously essential that a nationalized industry should pay its way as well as any other, and the need for economic efficiency must, therefore, be as great in the ramifications of the Ministry of Civil Aviation as in the Corporations themselves. The only complete justification, apart from any political ideology, for the nationalization of airlines lies in the fact that so many of the essential ground services are already and necessarily in the hands of the State. The cost of these ground services must be included in any balance sheet.

"Flight" photograph.



THE C.O. DEMONSTRATES : Group Captain E. M. Donaldson, D.S.O., A.F.C., commanding the R.A.F. High Speed Flight, maintains that handling the Meteor at over 600 m.p.h. is "too easy," but his flying on a training Meteor IV proves him to be exceptionally skilled. Further news of the High Speed Flight appears on page 59.

RETURN FLIGHT

New York to London by Air : The Crew : Some Details of B.O.A.C. Constellations and their Operation

By Maurice A. Smith

"Flight" photograph.

Last week the author gave some impressions from the passenger's point of view of a flight to New York by B.O.A.C. Constellation. The return journey is now dealt with briefly and the Constellation and its equipment are discussed in more detail

AFTER spending a week in New York, Sunday lunch came round in what seemed a very short while, and it was time to emplane for the flight home to London Airport. Bangor II, G-AHEL, was again the aircraft, with Capt. L. V. Messenger in command. It took very little time to check passports at La Guardia and, after a few minutes' delay at the gate caused by A.A. and Pan American aircraft ahead on the congested tarmac, we were airborne for Gander.

Flying north over cloud, the weather became appreciably colder, and at Gander it was necessary to replace jackets and waistcoats. Tea was taken with strawberries, ice cream and fruit cake. Everything was quickly and efficiently dealt with and, replenished with food and fuel, the west to east crossing was commenced at dusk, a few minutes behind schedule. The flight was made at between 9,000 and 10,000 feet, and observations showed that at 04.30 hr G.M.T. at 30.00 deg W our ground speed was 262 m.p.h. and air temperature −7 deg C at 10,000 feet; at 07.00 hr we were flying at 9,500 feet at 15.00 W with ground speed 282 m.p.h. and air temperature −1 deg C.

On waking up to bright sunshine and the steady roar of the engines, there was just time for a shave and wash before descending to Rineanna and breakfast.

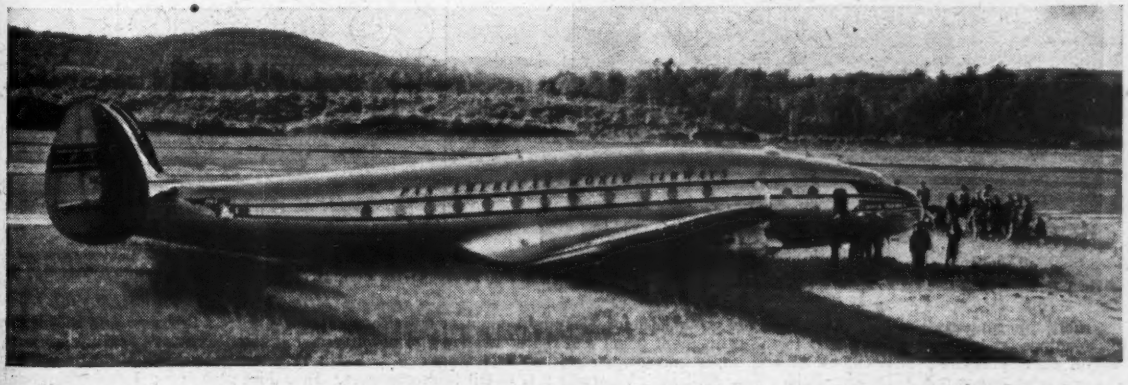
No extra fuel was needed for the flight on to Heathrow and with the Constellation flying light, the take-off and climb were particularly impressive. Measured with watch and pocket altimeter the initial climb to 2,000 feet took only 1 min. 24 sec. Take-off to touch-down took 1 hr 52 min.

The return flight from New York seemed to bring home more forcibly what travel by air can mean: lunch on Sunday in New York, take-off, read the newspaper, have tea and Gander is seen below. Take-off again, put watch on five-and-a-half hours and it is bed-time. Sleep accounts for the over-ocean period and breakfast in Ireland is the next event. Final take-off follows, and then two hours airborne plus one in a car, and one can be in London just 24 hours after leaving New York office. The time-table was given last week on page 31.

The Constellation

As a result of a forced landing at the start of a trans-atlantic flight made recently while two well-known film stars were passengers, Constellations received a good deal of not-too-welcome extra publicity. A fault in an auxiliary drive caused a fire in the starboard outer engine and ultimately the complete engine, still burning, fell out. Talking recently to a Lockheed engineer responsible for modification of the drive, the story was given as follows:—

The blower drives for the cabin pressure are taken from



The Pan American Constellation which belly landed beside the runway at Willimantic after a burning engine had fallen out. Surprisingly little damage resulted, and the aircraft is to be flown out on three engines.

RETURN FLIGHT

the back of the outboard engines and the bearing for the shaft has proved very lubrication-sensitive. Should the bearing fail, the shaft, having no enclosure or separate support, can oscillate and may fracture a hydraulic pipe close to it. This is what happened to the Pan American machine. The fire, which probably resulted from free hydraulic fluid, failed to respond to feathering and the extinguisher.

The Wright Cyclone 18, GR-3350 engines have a five-point rubber-block mounting and quickly detachable connections, and after some time the burning engine fell out. It is suggested that to lose both fire and worthless engine is, under these circumstances, perhaps the best thing that could happen. The Constellation subsequently made a successful belly landing on the grass beside the runway of a convenient airfield (Willimantic, Conn.) no one being hurt. Damage to the aircraft was, incidentally, very slight. Some patching up and straightening out underneath is all that Lockheeds consider necessary to make it ready to fly out on three engines and cross the continent to Burbank for full repairs.

Cabin Blower Modification

Modification kits for the blower shafts are almost ready, and cabin pressurization and conditioning should be back in about two weeks for all airlines using Constellations.

Constellations at present in service are not the company's idea of the ultimate achievement with this airframe, and they frankly said so to prospective purchasers many months ago. In pre-war days the Constellations were designed to meet T.W.A. requirements, and the Pan American company also placed an order for a number of them. When war broke out the companies naturally waived their rights and the C-69 military version went into production. At the cessation of hostilities the Lockheed Company were glad to be able to take over the C-69 military transport production line and announce almost immediate delivery of the interim Model 49 Constellation. With speed of delivery primarily in mind, this country and several others placed orders.

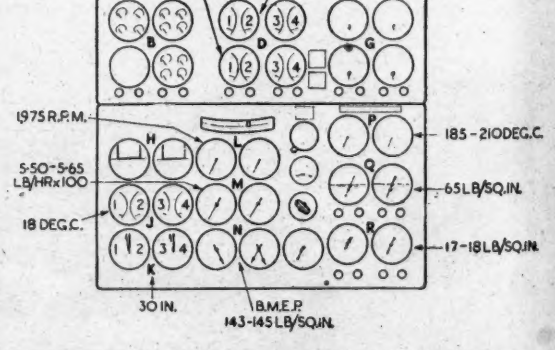
Some criticism with regard to equipment can be levelled at the galley of the Constellation here illustrated.

Later Constellations

The first pure commercial Model 749 ("Gold Seal") Constellations will not be delivered before November. They will not differ in outward appearance but will have a later mark of engine giving 2,500 h.p. for take-off with two-speed superchargers and fuel injection, and many refinements in cabin equipment, comfort, silencing, etc. Model 749, due in 1947, will have an all-up weight increase to 100,000 lb and a modified long-range wing. Thermal deicing will be a feature. An extra 1,000 gal of fuel and increased cruising speed of 310 m.p.h. will make one-hop east to west Atlantic crossings possible.

In spite of early troubles and now grounding pending investigation of another accident, B.O.A.C. captains consider their Constellations to be good aircraft. All five

"Flight" photograph.



(Left) Instruments and controls are closely grouped before the flight engineer on a Constellation. Direct fuel flow and B.M.E.P. readings are given. (Right) Key to the instrument panel and representative figures for cruising conditions. A = Engine front oil pump pressure; B = Oil cooler and upper and lower cowl flap indicators; C = Feathering buttons; D = Main oil outlet and inlet temps; E = De-icer fluid; F = Hydraulic reservoir; G = Oil tank contents; H = Fire warning; J = Carburetter air temps; K = Manifold pressure; L = r.p.m. indicator; M = Fuel flow; N = B.M.E.P.; P = Cylinder head temps; Q = Main oil pressure; R = Fuel pressure (Q and R also have warning lights, and the small non-lettered dials include a clock and synchronizer)

RETURN FLIGHT

to the British order were delivered strictly on time and at an informal B.O.A.C. party at the Wings Club in New York recently Lockheed's president, Robert E. Gross, spoke in the warmest terms of his company's wartime and post-war associations with this country.

Seats in the Constellation cabin are arranged in pairs in two forward-facing rows with a central gangway, and there are no transverse divisions. The centre arm can be taken out so that if a passenger finds a spare seat beside him, or a mother is seated beside her child, it is possible to sleep crossways on the two seats. The angle of the seat back is adjustable over a wide range and, with the pillows and rugs provided, a comfortable sleep is possible in one seat or across two. Individual lights focussed on the passenger's lap are used at night and in addition bright corridor lights are placed in the roof. There is also a circular window beside each outboard seat.

At the rear of the passenger cabin there is a wardrobe for coats and light overnight baggage, a steward's desk, and further aft, two separate toilets, each comprising two compartments. These are barely adequate provision for a full load of 42, but passengers seem to be able to get a wash, and electric razors help to relieve congestion round the men's wash basin. Mirrors are in rather short supply.

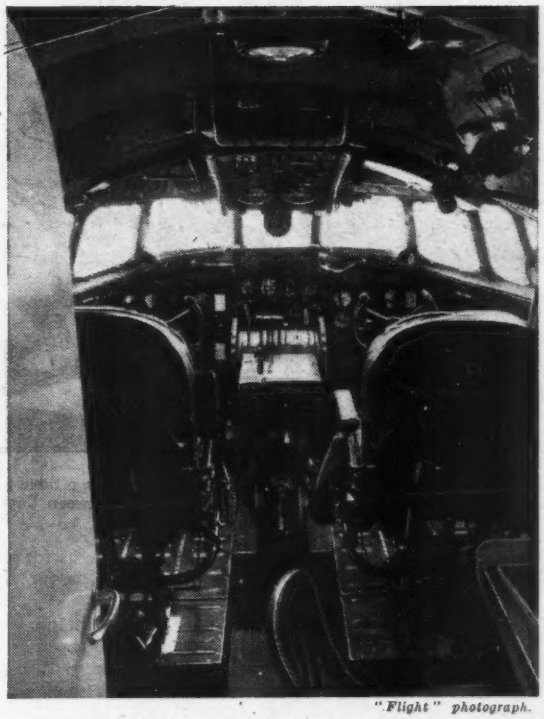
The Galley

Forward of the main cabin are the galley and the crew rest-room and stations. The galley calls for some criticism in that no sink is provided; also there is inadequate table space for the preparation and laying out of food trays and insufficient drawer space for silver. The water tank for the rear basins is located in the roof of the galley and cupboards and the dry ice refrigerator are found beneath it.

The compartment is quite roomy but has no window, and much of the room is taken up with radio equipment and dinghies It is intended later to cut a serving hatch in the door between galley and cabin, and it is possible that one or two stewards and one stewardess will be carried. At present the crew is all male and in addition to the three stewards comprises captain, 1st officer, navigation officer, two engineers and a radio officer.

From the pilot's point of view the Lockheed Constellation has a number of good features, and the cockpit layout is characteristically systematic. The majority of the engine instruments and controls are grouped before the flight engineer but the essential dials, switches and levers are duplicated for the pilots. Ahead of each control column are standard blind-flying panels and just outboard of each is the S.C.S.51 indicator for blind approaches. In the middle are duplicate boost and r.p.m. indicators and the Sperry auto-pilot panel. Centrally overhead are the radio compasses, V.H.F. and H.F. controls, and beside the captain's seat on the port side the grouped switches for electricalities.

The central pedestal supports all the usual controls and in addition the auto-pilot engagement levers and trim



"Flight" photograph.

The pilot's cockpit is well arranged and comfortable, although the roof is low and the screen very shallow.

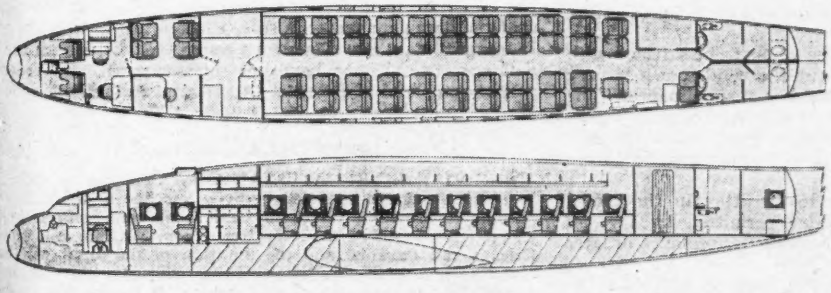
mers. Particular features of this excellent gyro-pilot are the smooth engagement, "finger" trimmers on the pedestal, and the duplicate trimming knobs on the Sperry panel. Army Air Corps specifications for the military transport called for a separate electric motor and self-contained power unit for the auto-pilot. This is continued on the interim Constellation, and, placed in the nose, is the cause of an irritating whine in the cockpit which is otherwise very quiet.

Powered Trimmer

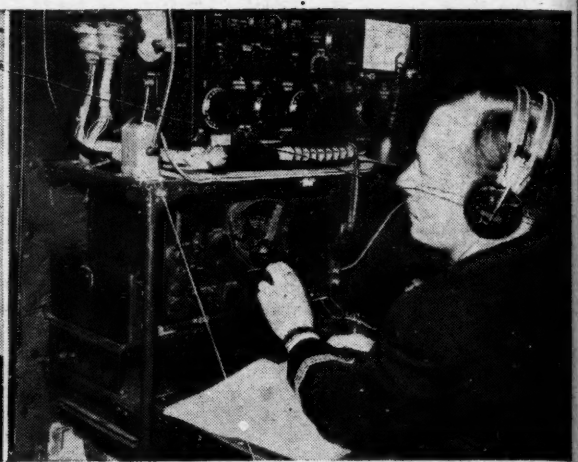
Another notable feature is the optional powered elevator trimming device. In addition to the normal hand wheel, a switch brings a small electric motor into use, and by pressing with thumb or finger either of two small "firing buttons" on the control column, the pilot can adjust fore and aft trim on the approach without taking his hands off the control column and throttles.

During a flight, the author was able to take the controls for a few minutes and to try the effect of the hydraulic power boost used for their normal operation. All controls are undoubtedly heavy and it seems best to leave the rudder alone for straight flying. Ailerons feel as would be expected for a large four-engined aircraft, and elevators have a slow, rather delayed-action effect. Should the power-boost fail, a leverage increase of 3 to 1 can be brought into use for the elevator controls and the aircraft can be flown safely but with reduced elevator movement and within certain c of g limits. On the turn under these circumstances differential use of engines is a great help.

Circuit speeds after take-off



Plan and side views of the B.O.A.C. Constellation clearly show the seating arrangement and the space devoted to cockpit, galley, crew rest compartment and toilet.



(Left) The navigator has plenty of room and a large table surmounted by his Loran indicator unit. (Right) The Radio Officer's station between Captain's and Navigator's seats.

and prior to landing are all just about the same as for the Lockheed Lightning, and relevant flying speeds for the Model 49 Constellation are as follows:—

Maximum at sea level	235 kt. ind.
Maximum at 22,000 ft	260 kt. ,,
Maximum at 25,000 ft	247 kt. ,,
For fuel jettison	189 kt. max.
Wheels down	152 kt. ,,
Maximum for take-off flap	174 kt. ,,
Maximum for landing flap	127 kt. ,,

Flaps: Take-off = 60 per cent; approach = 80 per cent; and landing = 100 per cent. Flaps are of the Lockheed-Fowler type.

RETURN FLIGHT

Asymmetric flight figures include: min. speed for full control on three engines at take-off power, 81 kt. ind. Directional control with two engines feathered on one side, impossible below 110 kt. Critical engine-failure speed on the ground during take-off, 92 kt.

Maximum take-off weight is 90,000 lb, and maximum landing weight, 77,800 lb up to 6,000 ft altitude with full runway. The stall at about 80,000 lb weight with full movement of aileron is gentle and straight with a fairly pronounced shudder at an indicated airspeed of 77 kt. The nose position at the stall is very high and becomes more so with the use of a little engine power.

Among the devices fitted for emergencies, the provision for vacuum change-over to any of the four engines for supply to the blind-flying instruments is noteworthy. A final ultra-emergency supply from the cabin supercharger is available should all other sources fail, and one panel can be isolated if the need arises.

Beside the pilot's left shoulder, outside the window, is an ice pole to give an immediate visual indication of ice formation. The de-icers on the Model 49 leading-edges are of the pulsating rubber type.

B.O.A.C. captains seem on the whole to be satisfied with vision from the Constellation but the wind screen is very shallow and is composed of a number of small panes. The numerous frame members together with screen wipers appeared most distracting to the author. Two large electric screen heaters are provided to de-mist and de-ice the inside surface.

The more powerful engines to be fitted in the Model 649 and the cleaner leading-edge permitted by thermal de-icers will undoubtedly improve the performance of later Constellations.

A glance at the fuselage plan on page 57 will show the positions of the crew. Behind the pilots are the engineer's panel, illustrated on page 56, and the radio operator's set Further back again are the navigator's table and crew rest compartment.

Special navigation equipment includes Loran, radio altimeter and gyro drift sight. The Loran is a standard fitting on the Constellation but will probably be scrapped by B.O.A.C. as the sets become u/s. There is talk of reintroducing Gee for local navigation over Europe and for bad-weather control around airports. The Bomber Command system of "controlled holding" along lattice lines instead of "stacking" over an airport is particularly suitable for commercial aircraft. Passengers soon realise that they are flying in circles and naturally feel disgruntled, but they are less likely to notice temporary diversion and late arrival is the only cause for complaint.

Methods of Navigation

Over the American continent, navigation is strictly controlled by the use of Radio Range (and identification at each station). Across the ocean the radio compass and W/T fixes are used up to medium ranges, and Loran and astro-nav. are also used. Loran suffers from a dead area for about two hours flying about mid-ocean. On nearing the Irish coast, Radio Range again comes into use.

Met. information is good for the North Atlantic and all aircraft send to base an hourly report of the weather they are experiencing. Using D.R. alone, the maximum track error over a long period seldom exceeds thirty miles.

In bad weather there is, of course, a controlled let-down procedure for all airports and, as already mentioned, S.C.S.51 is carried. In addition the G.C.A. system may be used through normal V.H.F. channels.

From a brief study of crew duties, aircraft equipment, and flying procedure it once again becomes apparent that although we read almost daily about this or that new automatic device, about radar this or magic that to aid flying, the fact remains that the human element is still 100 per cent the dominant factor in safe, efficient airline operation. Passengers may, however, rest assured that British airlines will operate only the best and safest aircraft and crews will be composed of the most experienced and reliable men.

MONTREAL–LIMA

PERUVIAN INTERNATIONAL AIRWAYS plan to start a joint American-Canadian-Peruvian air line in the coming autumn to provide a direct air service between Montreal and Lima. Stops will be made at New York, Washington, New Orleans and Panama, and the duration of the flight will be about 18 hours. Eight Douglas DC-4s will make three flights a week in the early stages, but later it is hoped that daily flights will be scheduled. It is anticipated that, anyway for the time being, more freight than passengers will be carried.

An exclusive *Flight* photograph of personnel of the R.A.F. High Speed Flight. The Commanding Officer, Group Capt. E. M. Donaldson, D.S.O., A.F.C., is in the centre. To the left is Flt. Lt. N. F. Duke, D.S.O., A.F.C., and, to the right, Sqn. Ldr. W. A. Waterton, A.F.C. The Chief Technical Officer, Wing Cdr. McGregor, and the Engineer Officer, Sqn. Ldr. Porter, were absent.

1,000 Km.P.H. . . . OR MORE

R.A.F. High Speed Flight Re-formed to Attack Record

ON or about August 14 a Gloster Meteor IV flown by Group Captain E. M. Donaldson, D.S.O., A.F.C., Officer Commanding the newly re-formed R.A.F. High Speed Flight, will attempt to establish a new World's Air Speed Record. He must better by 8 k.p.m. (5 m.p.h.) the figure of 606 m.p.h. achieved by Group Captain H. J. Wilson in a similar aircraft over the Herne Bay course on November 7, 1945, and feels confident that he will, in fact, attain over 1,000 k.p.h. (622 m.p.h.). The attempt is a joint Air Ministry-Ministry of Supply venture, but Group Captain Donaldson takes his orders from C.-in-C. Fighter Command.

Two other pilots—Squadron Leader W. A. Waterton, A.F.C., and Flight Lieutenant N. F. Duke, D.S.O., D.F.C.—are on the Flight's establishment, and from what the C.O. said at Tangmere last week both these officers are likely to "have a crack." One of them will, in any case, fly the second of two specially groomed Meteor IVs which are expected to be delivered from the Gloster works within a few days.

For the present the Flight is equipped with three Meteors which differ from the Service Mk IV pattern only in having Machmeters and faired gun ports. Their Derwent V radial-flow turbine jets are rated at 3,600 lb static thrust. In these machines the three pilots are almost daily covering the 3-km course between Littlehampton and Worthing (more precisely Rustington and Kingston Gorse) at speeds between 550 and 610 m.p.h.

Visiting the Flight a few days ago Air Vice-Marshal Boothman, Assistant Chief of Air Staff (Technical Requirements) and 1931 Schneider pilot, who retains a partiality for fast aircraft, borrowed one of these hacks and comfortably topped 600 m.p.h. He pronounced the Meteor "so easy" by comparison with the temperamental Schneider floatplanes, agreeing with Group Captain Donaldson's view that no special qualifications or skill are demanded of the pilots of his Flight.

The two special Meteors will be standard Mk IVs except that the Derwent Vs will be adjusted to deliver 4,000 lb thrust or over, the guns will be removed, the ports faired in, and the cockpit hood will be of duralumin with 6in side panels of Perspex. The last modification has proved necessary because at the speeds hoped for the standard hood is softened and distorted by heat.

Commenting on a statement by the Gloster Aircraft Company that Wing Commander Beamont has already achieved 630 m.p.h., Group Captain Donaldson said that this speed must have been attained in a dive as the two special Meteors with fully rated Derwents were not available at the time of the claim.

No Friction

There has been some suggestion of resentment and friction between Glosters and the Service. No doubt the company would be pleased to establish a new record without official backing, but the Meteors it builds are Government property, and in any case to lay out a course is an undertaking requiring official resources and funds. Certainly there is no personal animosity between the pilots of the High Speed Flight and the Gloster team: the latter frequently drop in at Tangmere for lunch.

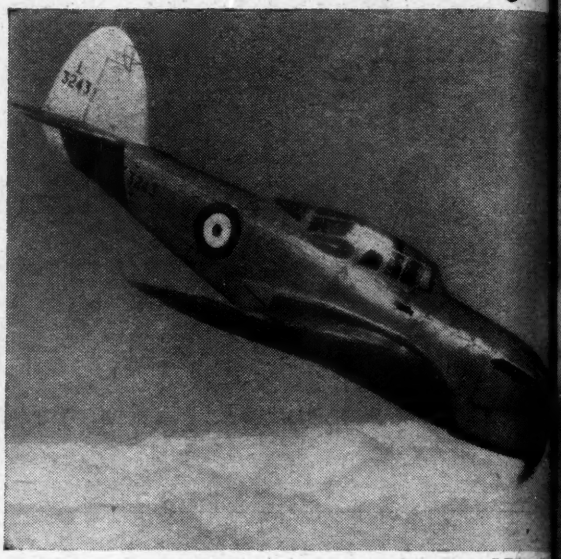
The laying out of the course—a highly important and exasperating task—is the responsibility of Wing Commander McGregor, seconded from the Ministry of Supply. Wing Commander McGregor explained that buoys and "camels" will be used for marking the course and that six balloons will be flown to indicate height. The "camels" are made of rubber and canvas and measure 10ft × 5ft. They are normally used for lifting sunken aircraft.

D

IN THE AIR—XVI

Battle, Defiant & Henley

Improvement of a Standard "Light Bomber" of Early War Days : Two Maids of All Work



"Flight"

Good as it was, the Henley, for various reasons, was never used operationally, and the comparatively few production aircraft were finally given target-towing and similar duties. From the pilot's point of view the Henley behaved very much as an enlarged Hurricane.

ONE of the more curious things about flying—at least in the eyes of anyone with a due sense of skill shortcomings—is that no aircraft, ever, in fact, turns out to be quite as difficult as in one's previous imaginings. It would be an exaggeration to say that "all aircraft are just aircraft," and to leave it at that, but this is very nearly true, and there are hardly any exceptions to the general rule that if you can fly one type with reasonable competence the rest can at least be flown with safety.

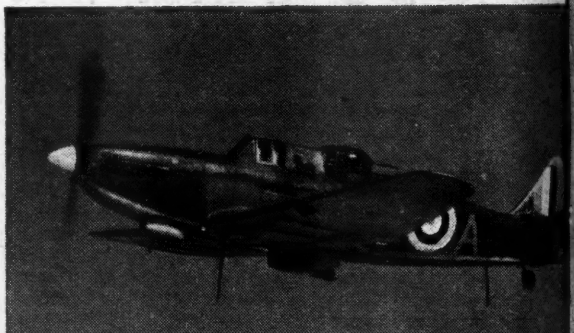
At the time when I first poured myself into the cockpit of a Fairey Battle I had done only an hour's solo on anything of similar size and complication in the single-engined line, and on the morning when I had been told that this fearful war-wagon was to be handed over to me, I ate breakfast in the state of mind of one about to leave the condemned cell. In fact, the thing turned out to be just too easy, in spite of the smallness of the airfield which was being used and of my comparative newness to the business of "drill." I went through the performance of covering this drill about three times before daring to turn into wind, and was unencouraged even by the innocent confidence of the airman detailed to ride as ballast. It was only after the throttle had been opened, the rudder waggled and the take-off actually started that I felt, once again, the partial truth of the just-another-aircraft theory.

By "INDICATOR"

Undoubtedly, my most lasting impression of the Battle was of the intense heat which could sometimes fill the driving compartment and, in cases where there was an open flare-shoot, of the cloud of dust which, combined with the overheating, produced quaintly Saharan conditions. Otherwise this aircraft, even to the complete newcomer, behaved rather like a large tin Swallow. (For the benefit of the new generation, the B.A. Swallow was a lightly loaded two-seater, based on the German Klemm, to be found airborne over this country in pre-war days.) The driver was seated well forward with a view over the leading edges of the vast riveted expanse of the wings, and the whole affair felt most extraordinarily solid and safe.

The flap and undercarriage selector levers sprouted from the floor on one's left and, since the undercarriage lever had a not-too-easily-found safety catch, retraction after take-off could be quite a contortionist performance. Very soon after I had put in an hour or so in the Battle and had been passed along to even more "advanced" aircraft, this particular machine was flown, undoubtedly for the first time in the history of the type, by a well-known one-armed pilot.

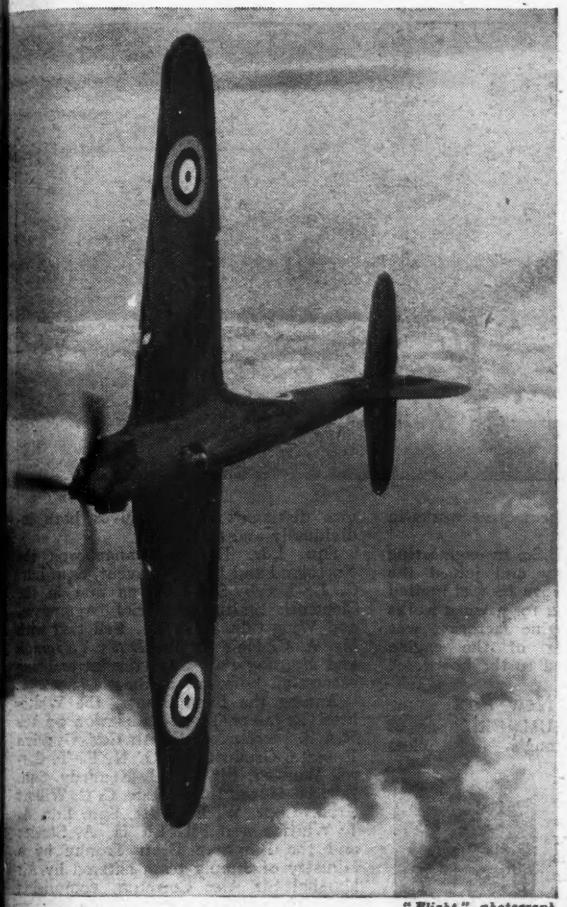
When I complain of the difficulty of finding and moving the undercarriage control, it can be imagined that this astoundingly enthusiastic pilot needed to do a good deal of thinking and planning, unused as he was to "drill" and other new-fangled ideas. His method—he had lost his left hand—was to lower the seat as soon as the machine was safely airborne and, while more or less out of sight of land, to reach for the control with his right hand. As soon as "up" had been selected—and in the meantime he had been flying with stick between his knees—he raised the seat again to see what was going on. I gather that



The Defiant was an interesting and, for its time, quite successful "experiment" in armament—a fighter with a four-gun turret and no fixed armament.

the post-take-off evolutions of the Battle gave the C.F.I. something rather worse than heart failure, since the experiment was being made at his and the Commandant's risk.

One of the mildly disturbing features of the Battle's take-off was the fact that the change of pitch of the two-position airscrew reduced the recorded revolutions of the Merlin on the climb to something which had very much



"Flight" photograph.

In spite of its comparatively large span, the Battle was quite a surprisingly handleable aircraft.

the appearance of complete engine failure. However, one soon became accustomed to this, and to the extraordinary arrangement of the undercarriage lights which, in a very real sense, shouted "wheels" at the driver in unmistakable terms. Elevator and rudder trimming work was completed with the aid of a couple of little cranks on the left and moving in the same plane. These must have given the one-armed hero opportunity for ingenuity on a very advanced scale.

The airfield on which I landed one of the last Battles to be flown—to its break-up yard—was probably at least as big as that from which I had originally taken off, shakily enough, in 1939. Yet four or five years of steadily increasing airfield size and runway length had so upset my unconscious calculations that I had the greatest possible difficulty in keeping within its boundary on landing. An area which would have been considered quite normal in 1939 looked, in 1945, very little larger than a cricket pitch—and the break-up Battle (being delivered by the R.A.F. because it wasn't fit to be ferried even by the professional drivers of worn-out horrors) could not offer more than a feeble half flap and had nothing very much in the way of braking urge. We ended up with a wing-tip over the edge of a bank, after a deliberately fostered ground-loop. Oh, I know it was going to be broken up anyway—but not that way, and if I'd gone over that edge there would still have been 765C action to be taken, and a rocket to be avoided if possible.

I believe that the Hawker Henley was designed to the same specification as the Battle, but, as Hawkers were, at that time, busy enough with the production of Hurricanes and the Battle could be quantity-produced easily, it became the accepted light bomber of the period. Which was not to say that the Henley—later relegated to target-towing duties—was not, for its time, a very good aircraft. It had many of the familiar characteristics of the Hurricane, with a wider-track undercarriage and the most immense capacity for taking rough treatment on the ground and in the air. As in the case of the earlier Hurricanes, the undercarriage and flap operation demanded the use of more hands than were naturally available, since, after undercarriage selection, a power-valve lever had to be depressed and held down until the particular action had been completed.

Turret Fighter

Except for a somewhat pronounced tendency to beat its rudder control, even with full right bias, during take-off, the Boulton-Paul Defiant was without any rememberable curiosities, though I believe that the aileron and shroud settings involved the production test pilots in a good deal of hard work. The difficulty, as far as I remember, was to arrange things so that excessive upfloat would not appear at higher air speeds on one side or the other.

The Defiant was an interesting, not to say exciting, experiment in the way of night fighters, though the immense four-gun turret—complete with retracting fairings—made surprisingly little difference to the handling. Theoretically, of course, a large turret in such a position should have upset all airflow calculations and produced very queer results to the elevator and rudder control. The only strange disturbances of this kind, in my own small experience of the type, were caused by something quite different. By one of those most unlikely coincidences, the failure of a single faulty cowling button support caused all the other buttons on the same side to shear during a dive and left the entire engine half-cowling flapping vertically upwards in the slipstream. Luckily the cowling did not remove itself entirely, but remained poised more or less vertical until the moment of landing. In addition to blanking out a great deal of the forward field of view, the effect of this obstruction on the elevator and rudder control reactions was unpredictably absurd.

The following is a list of the aircraft which have already appeared in "Flight" as part of the "In the Air" series.

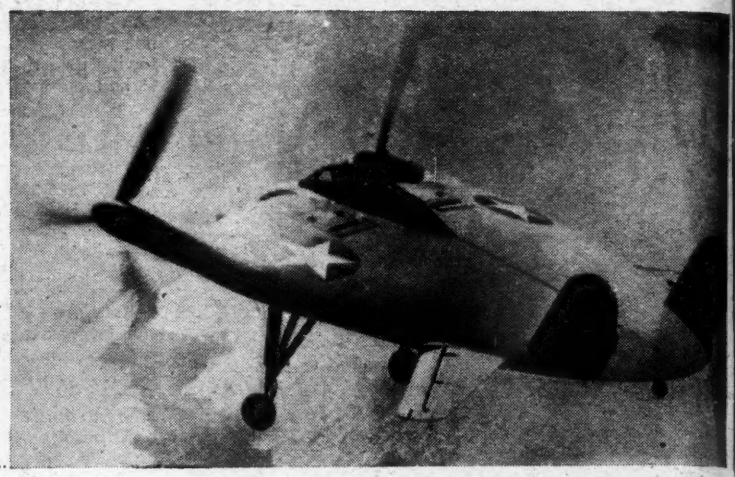
Beaufighter	*September 20th, 1945*
Oxford & Anson	*October 18th, 1945*
Fortress & Liberator	*November 1st, 1945*
Blenheim	,, *15th, 1945*
Airacobra & Kittihawk	,, *29th, 1945*
Hampden & Hereford	*December 13th, 1945*
Gladiator & Gauntlet	,, *27th, 1945*
Wellington	*January 3rd, 1946*
Spitfire I—IX	,, *24th, 1946*
Spitfire IX—XXII	,, *31st, 1946*
Boston & Havoc	*February 28th, 1946*
Lysander	*March 21st, 1946*
Whitley & Albemarle	*April 4th, 1946*
Master & Martinet	,, *11th, 1946*
Mosquito	*May 2nd, 1946*
Hudson & Ventura	,, *16th, 1946*

PARLIAMENTARY IRRELEVANCE

FOR the second time within the last few weeks there has been a question in the House about the allocation of petrol for air charter work as compared with the grant for taxi cabs. As the Minister of Fuel and Power, Mr. Shinwell, pointed out, the allowance of fuel for charter or taxi flights is limited to the amount required to provide a maximum of 60 flying hours for each aircraft per month. The petrol allowance for provincial taxi cabs varies between 66 and 106 gallons per month according to the horse power of the vehicle, while there is a monthly allowance for a metropolitan taxi cab of 120 gallons.

We find it very difficult to follow the reasoning of the Member of Parliament who tries to compare the one allocation with the other, and even goes so far as to suggest that the allocation to charter aircraft should be cut down so as to increase the taxi cab petrol allowance.

HERE AND THERE



MARINE MONSTER : Built by Chance Vought in 1942 for the U.S. Navy, the V-173 shown here was the prototype of the XF5U-1 fighter, now nearly ready for trials. A speed range of 40-425 m.p.h. is claimed.

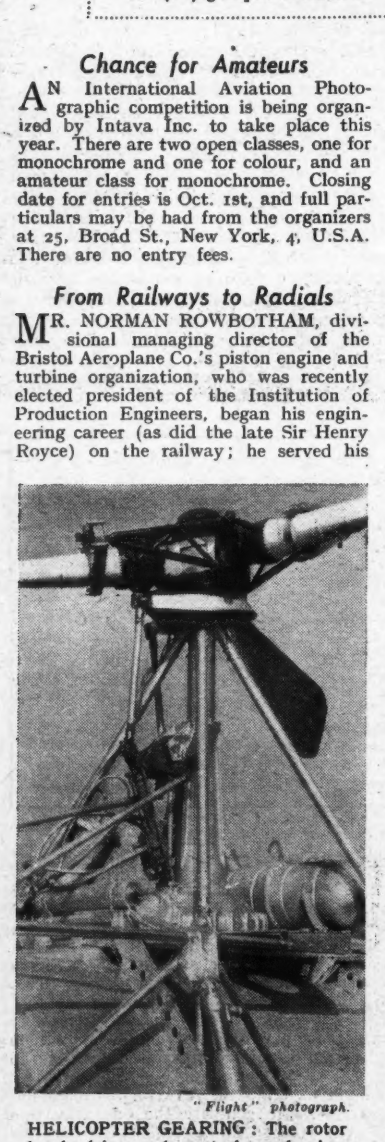
Chance for Amateurs

AN International Aviation Photographic competition is being organized by Intava Inc. to take place this year. There are two open classes, one for monochrome and one for colour, and an amateur class for monochrome. Closing date for entries is Oct. 1st, and full particulars may be had from the organizers at 25, Broad St., New York, 4, U.S.A. There are no entry fees.

From Railways to Radials

MR. NORMAN ROWBOTHAM, divisional managing director of the Bristol Aeroplane Co.'s piston engine and turbine organization, who was recently elected president of the Institution of Production Engineers, began his engineering career (as did the late Sir Henry Royce) on the railway; he served his apprenticeship in a locomotive works in his native Manchester.

Later he took his B.Sc. in engineering at London University and joined the A.I.D. in 1915. In 1922 he was invited to join Bristol's and in 1943, when works manager of their engine factories, was made chief engineer of the engine division and appointed to the board.



"Flight" photograph.

HELICOPTER GEARING : The rotor head, drive and control mechanism of the Cierva W9 helicopter

Test Pilot's New Post

MR. MAURICE SUMMERS, one of Vickers-Armstrong's test pilots who met with a serious accident while flying a Warwick some time ago and has been "grounded" for medical reasons, is now in charge of the firm's information and publicity department. Previous to joining Vickers - Armstrongs, Mr. Summers was for a considerable time with the Gloster Aircraft Co., Ltd., as a test pilot, and worked with the late Jerry Sayers.

Mr. M. Summers

Mitchell Scholarships

AS a memorial to the work of R. J. Mitchell, two scholarships have been founded to train students in aircraft design and engineering. They will each be worth £60 a year and will be awarded for three years at University College, Southampton. The minimum age limit is 17 years.

Applications to sit for the examination should be made to the Registrar of the college not later than Aug. 12th, and the candidate should state his education, experience (if any) and age, and must enclose a recommendation from employer or headmaster.

Candidates who satisfy the examiners will be called for interview some time early in September, and the first of the awards will, it is hoped, be made in time for successful candidates to begin training next October.

R.A.F. at Bisley

NOT only was the King's Prize at Bisley won by a serving officer of the R.A.F., Sqn. Ldr. C. C. Willott, for the first time in the history of the competition, but other members of the same Service distinguished themselves both individually and as teams.

Sqn. Ldr. R. F. Strange won the Northland and Donegall event, Sqn. Ldr. C. L. Laceby-Stevens was first in the Clementi Smith Memorial Aggregate, and Wing Cdr. B. G. M. Bell tied with Mr. A. C. Hale for the *Daily Telegraph* and *Morning Post* Cup, the latter being successful, however, in the tie shoot.

Among the team events, the Whitehead Revolver Trophy was won by the R.A.F. represented by Air Cdr. G. Silyn Roberts, Group Capt. G. N. E. T. Carroll Worsley, Flt. Lt. H. Kennedy, Sqn. Ldr. H. Howard, Sqn. Ldr. C. C. Willott Group Capt. W. E. Watt, Sqn. Ldr. A. J. Whiting and Flt. Lt. H. A. Steele; and the Bargrave Dean Trophy by a Ministry of Supply team entered by Air Marshal Sir Alec Correton, comprising Group Capt. Watt, Air Cdr. Silyn Roberts and Group Capt. Carroll Worsley.

Tentative

THE Ministry of Civil Aviation is to run a competition for the design and layout of permanent buildings to replace the tents at London Airport (Heathrow) and a committee set up by Lord Winster is consulting airline operators about their space requirements and is also discussing the subject with the Royal Institute of British Architects.

No further details are available as we go to press, but an official announcement may have been made by the time these lines appear in print.

A 485-m.p.h. Fury

HAWKER'S designer, Mr. S. Camm, estimates that the latest version of *Fury I*, illustrated in *Flight* last week, will attain 485 m.p.h. with methanol/water injection for its Napier Sabre VII engine.

"Stringbag" Record

SOME details of his Swordfish flying during the war which were given by Lt. Cdr. (A) W. Machin, Fleet Air Arm, in a letter to the Fairey Aviation Co., Ltd., have been passed on to *Flight* with the suggestion that they probably constitute a record.

His total flying time in Swordfish was 1,436 hr 55 min. This involved 3,514 separate flights during which 6,908 passengers were carried. More than 1,000 of the flights were made in the same air-

HERE AND THERE

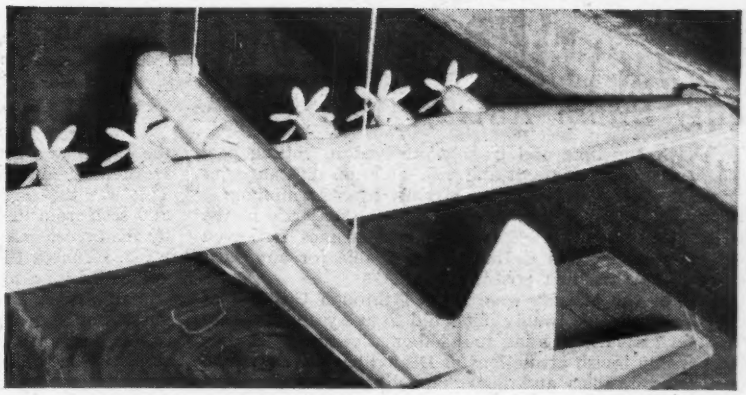
craft—K.8876—which, by October, 1943, had completed 1,437 hr 50 min in the air and was still flying in 1945!

Over 6,000 of Lt. Cdr. Machin's passengers were A.T.C. and Sea Cadets.

A highly creditable performance, but we imagine that the total hours and number of flights in the same type of aircraft could be challenged, as records, by more than one E.F.T.S. instructor or "504" banner towing veteran.

Dominion Honours

AMONG the list of Canadian names in the Dominion Day Honours List are those of Mr. D. C. Coleman, chairman of Canadian Pacific Airlines, and Mr. W. A. Newman, manager of the C.P.R.'s research department, who was in charge of Canada's entire aircraft industry during the war.



DOUBLE BUBBLE: The figure 8, or "double bubble," hull section is one notable feature of this model flying boat lately shown at R.A.E. Reference is made to the design on page 72.

News in Brief

FIVE Hadrian transport gliders, packed in 25 crates, which were taken over from the U.S.A.A.F. by the British Government when the U.S. Forces left this country, have been sold to Czechoslovakia, who is said to require them for training purposes. It is understood that tenders will be invited for some 800 other military gliders, many of which have never been uncrated.

* * *

Reykjavik airfield, constructed by the British Army during the war at a cost of about £5,000,000, was handed over to the Icelandic authorities on July 6th, and became their property, free of charge, in accordance with an agreement made before it was built. At the ceremony, Sir Gerald Shepherd, British Minister to Iceland, handed a symbolic silver key to Mr. Olafur Thors, the Icelandic Prime Minister.

* * *

Sir George Paget Thomson, scientific adviser to the Air Ministry since 1943, and professor of physics at the Imperial College of Science and Technology, has gone to America to act as scientific adviser to the British delegation of the Atomic Commission of the United Nations headed by Sir Alexander Cadogan. Sir George was chairman of the committee of British scientists appointed in 1940 to develop atomic energy.

* * *

Mr. E. C. Eric Smith, chairman of Rolls-Royce, Ltd., said in his statement at the annual general meeting recently that a substantial contract had been received for engines to be installed in commercial aircraft under construction in Canada, and that in addition the company had under consideration the granting of manufacturing licences in foreign countries.

* * *

The honorary degree of Doctor of Science has been conferred by Birmingham University on Mr. Hugh Warren, M.Sc., M.I.E.E., managing director of the B.T.H. Company and formerly head of the firm's research. Dr. Warren is the author of many technical books and papers, and the honour particularly recognizes his work in industrial research and technical education.

* * *

Admiral Sir Lionel Preston has resigned his office as chairman and managing director of Titanine, Ltd., but retains a seat on the board. Mr. Albert Fletcher has been appointed chairman, Mr. G. W. R. Ward (son of the firm's founder) becomes managing director, and Mr. William E. Robinson has been made a director.

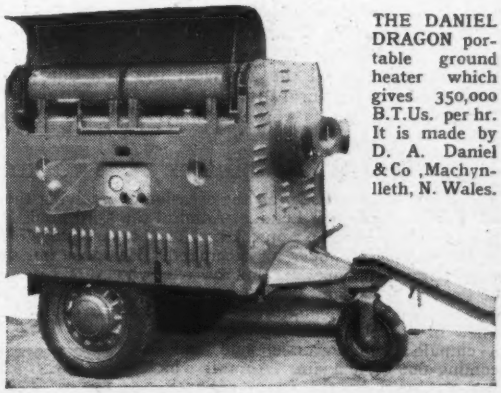
* * *

Two members of Queen's University Air Squadron, Belfast, won five of the events in the recent athletic meeting between Queen's and Oxford, thus largely contributing to the former's victory. They were Prince Adedoyin who won the high jump, long jump, hop step and jump, and the 120 yard hurdles; and J. A. Willis who won the 220 yard and was second in the 440 yard race.

A solution containing 43 lb of hexachlor-cyclohexane mixed with 74 gal of dieselene and 6 gal of lubricating oil has been successfully sprayed from a specially equipped Beaufighter of the R.A.A.F. on a Victoria wheat crop infested by grasshoppers. The casualties among the "hoppers" was described as "highly satisfactory," and further experiments will aim at reducing the cost.

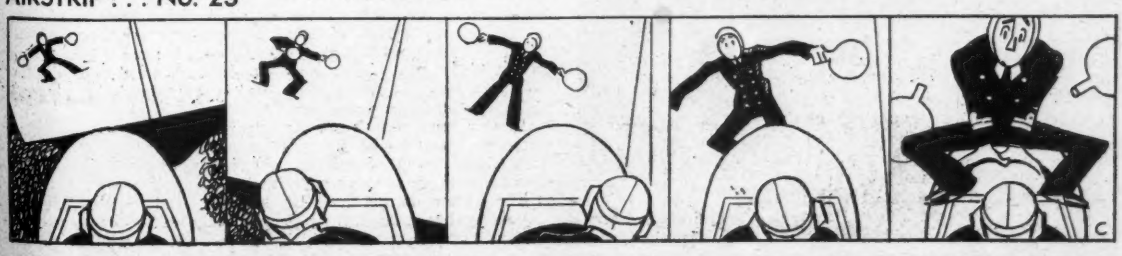
* * *

Flight has been asked to correct an advertiser's error in an announcement which appeared on page 30 (advertisements) in the issue of July 11th, regarding a change of address. This should have read "British Aviation Services, Ltd., now at 1, Gt. Cumberland Place, London, W.1, and not "British Aviation Insurance Co., Ltd.," whose address remains at 3/4, Lime Street, London, E.C.3.



THE DANIEL DRAGON portable ground heater which gives 350,000 B.T.Us. per hr. It is made by D. A. Daniel & Co, Machynlleth, N. Wales.

AIRSTRIP . . . No. 23



Deauville Rally

Fifty British Aircraft Visit France : First Big International Meeting

EVEN the time and trouble involved in getting past the present passport and visa situation did not deter some 160 guests with 50 aircraft from assembling at Deauville last week-end. Admittedly the majority of the visitors probably travelled in chartered machines, but, even so, the turn-out was distinctly remarkable for any such affair during the first post-war year.

Most of the aircraft were cleared through Customs at Croydon, but some twenty pilots did so at Lympne—where the later arrivals, at least, found themselves torn between the possibly lavish attractions of Deauville, so well known from pre-war rallies, and the perhaps simpler ones attendant on the opening of the Cinque Ports clubhouse. One or two succeeded in combining something of each.

Since all but three or so of the visiting aircraft were single-engined, it was natural that nearly all should have made the outward flight by way of Gris Nez and the French coast, during which the crews had the opportunity of seeing the changes made by the campaign of 1944. At Gris Nez, for instance, the huge emplacements which had housed the cross-Channel guns stood out amidst the damage done by the Lancasters during the assaults on the local strongpoints. Two marked features of the coast nowadays are the obstructions which still litter the beaches between the towns, and the hutting and temporary housing which have replaced the wrecked buildings.

The arrival at Deauville had been timed for the period between 10.0c and 12.30 and the appropriate competition was won by Mr. Geoffrey de Havilland. It was fortunate that he was the one to take the cup, for his aircraft, an Airspeed Consul, was one of the few machines suitable for carrying away this somewhat enormous trophy.

Later arrivals brought the final count up to 49 British aircraft, with three French, one Danish and one Belgian aircraft to add an international flavour. Arrivals were met by M. George Olivier, *chef de propagande*, of the Organizing Committee, and were taken by car to the Royal Hotel, where the whole party was turned loose. The organizers had arranged for all the facilities of Deauville to be at the disposal of their guests, and there was an almost embarrassing selection ranging from tennis, golf and bathing to the opportunity of losing money at the casino.

Mme. André, the wife of the president of the Organizing Committee, received the guests at the gala dinner at the Ambassadeurs restaurant in the casino at 9.30 p.m. During the dinner the guests were welcomed in a brief speech and the signal was given for the highlight of the evening—a Deauville feature remembered from the last rally in 1939. This was the ring of fireworks set off round the ballroom and seen from inside as sheets of golden rain being blown by the breeze across the big windows.

Mr. Kenneth Davies duly replied on behalf of the guests and called for a toast to Deauville. Dancing to two bands, with the other attractions of the casino, kept most of the guests out of their beds until well after three o'clock, when it was a strange contrast to our shortage of electricity to come out on to lighted streets with the cafés and shops still open. Ices and hot chocolate were still being sold at 3.30 a.m.

Bastille Day started unexpectedly quietly. It had considerately been left for the guests to decide how they would employ their time. Some made the most of Deauville itself, but a number took the opportunity of visiting, by air or road, Caen or the beaches.

Those who decided to see the battlefields from the air arrived at the airfield to find that there was almost a queue waiting to fly the delightful KZ II Danish high-wing monoplane with a Cirrus Minor engine. It was flown by a number of pilots and demonstrated its qualities by using only one small portion of the airfield while other aircraft continued to take off. Later it was used to fly a photographer who succeeded in obtaining photographs of various aircraft formating over Deauville.

The party dispersed as soon as they were able on the morning of the 14th, mostly returning to England, while a few, with more time, went to Jersey or southwards. A larger undertaking is that of Flt. Lt. Ogden, who was on his way to Australia.

One regret is that, with fifty British aircraft present, only three French pilots were able to attend.

FAR EAST SURVEY

A HYTHE class flying boat took off from Poole on Monday, July 15th, on a survey flight to the Far East. In charge of the flight is Capt. H. W. Alger, manager of B.O.A.C.'s No. 4 Line. The aircraft will follow the normal flying boat route to Calcutta, and thence via Bangkok to Hong Kong, where it should arrive on July 22nd. This flight is particularly interesting since it provides the first indication of a reopening of the Far Eastern route, and is the last of the survey flights necessary for B.O.A.C. to complete its various long-distance services.

LORD LOUIS' TRIBUTE TO THE AIR

IN his Guildhall speech, on the occasion of receiving the Freedom of the City of London, Admiral the Lord Louis Mountbatten expressed deep appreciation of the part played by the Allied Air Forces under his command. He spoke not only as the Supreme Commander but as one who knows something of the difficulties and perils of flying in the Far East. In his own words flying conditions were "truly terrifying." He knew of no case of an aircraft entering a cumulo-nimbus thundercloud and of coming out of it again. Aircraft which had ventured on the fringe of such a cloud and had turned back before their wings were torn off had been dashed down 3,000ft in 30 seconds, between mountain ranges and with a visibility of 10ft. These great thunderclouds frequently extended from ground level to 30,000ft so that one could fly neither under nor over them, though by day a pilot could, if he had sufficient petrol, try to go round them. Lord Louis emphasized his point about petrol because aircraft were usually working at extreme range and could not afford big diversions.

Admiral Lord Louis Mountbatten.

The Supreme Commander paid tribute to the British and American Chiefs of Staff, who, in spite of S.E.A.C.'s low priority, allocated sufficient transport aircraft to make possible the recapture of Burma from the north-west. The number of aircraft which could be spared, however, when added to those already available, met only half the final requirements; the other half was made up by flying double the hours normally allowed for sustained operations. Working an entire Air Force at double hours had hitherto been considered permissible only for a day or two, or in an extreme emergency for a week or two, but these British and American crews worked day after day, week after week, month after month, and produced the greatest air supply ever known. During the campaign, well over 600,000 tons were lifted by air to the armies in Burma. As the troops advanced, and the hope of any surface-supply receded, the monthly figures for air supply rose sharply, and in March, 1945, no less than 94,300 tons were delivered by air, including the flying-in of 28,000 reinforcements, and the flying-out of 13,900 casualties.

In this same month the American Air Transport Command lifted 78,000 tons of supplies over the notorious "Hump" into China, which means that an average of nearly 6,000 tons was being flown through over Burma every day.

The atomic bomb, said Lord Louis, did not defeat the Japanese, but offered their Emperor the excuse to accept an unconditional surrender which had become inevitable.

A Discussion of Current and Projected Designs: Army-Support Aircraft "Mediums" and "Heavies"

Jet Bombers

By H. F. KING, M.B.E

Before the recent completion of the Douglas XB-43 (above) jet-propelled bombers were exclusively German. The new Douglas, interesting and ingenious as it is, is an adaptation of a piston-engine machine

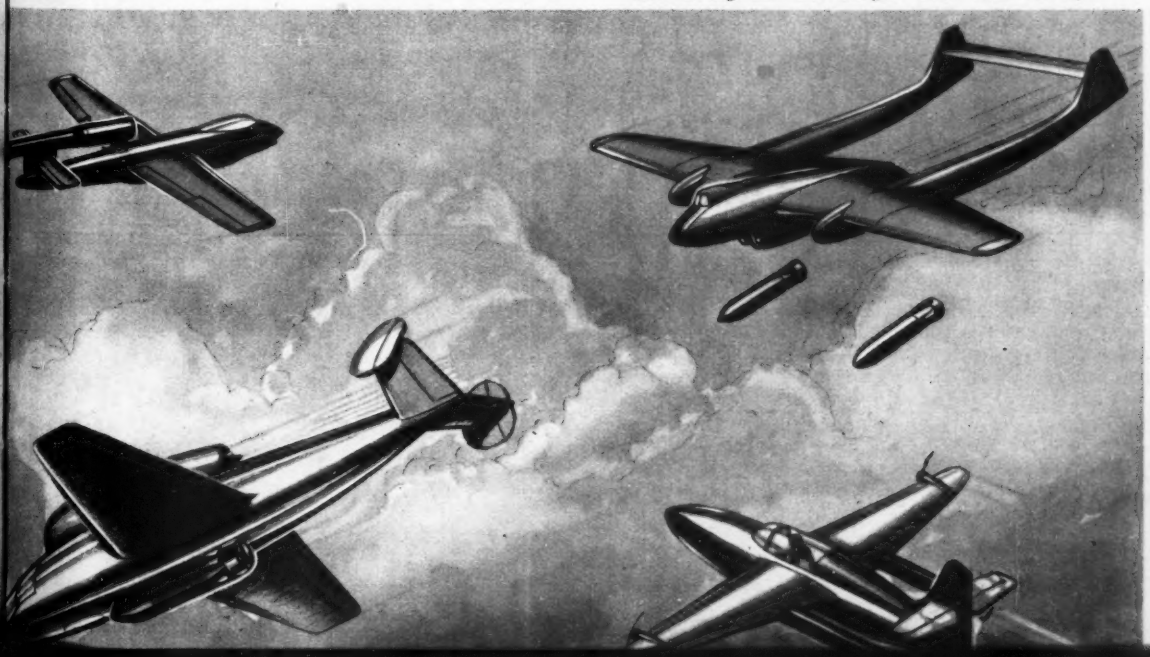
THE D.H. Vampire and Gloster Meteor are well established as first-line R.A.F. fighters, and Lockheed's Shooting Star, counterpart of the Vampire, is standard equipment in the U.S.A.A.F. Russia, though lagging in technical development, has brought jet fighters to the service-test stage, while France, having acquired the licence for the Rolls-Royce Nene, is designing prototypes round this British unit. Even Sweden's small but efficient *Flygvapnet* has 540-m.p.h. Vampires.

This ready acceptance of jet fighters is the more remarkable in view of the absence of bombers powered with gas turbines. True, on the Shooting Star two 500-lb. bombs are alternatives to the drop tanks, and the Meteor can be similarly adapted for tip-and run bombing with two thousand-pounders; but before the recent appearance of the Douglas XB-43 genuine jet bombers provided with proper stowage and aiming facilities were exclusively German. Accordingly the writer offers no apology for drawing freely on German examples. Within two years, a complete range of prototypes, including, it is to be hoped, a few British, should materialise; meantime, it is instructive to consider possible jet bomber designs for various duties.

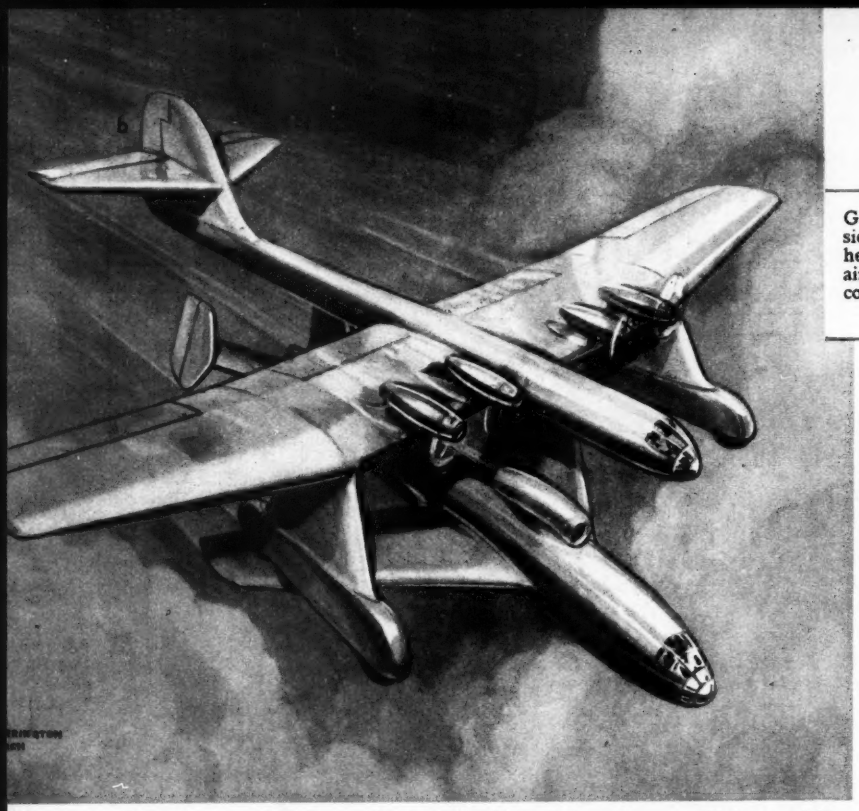
Pure-jet propulsion will be normal for all new bombers. If used at all, turbine-airscrew and ducted fan units will probably be confined to the heaviest night bombers, close-support dive bombers, and naval strike aircraft; the performance of opposing fighters and the effectiveness of directed missiles will militate against more general adoption. The relative merits of the pure jet, turbine-airscrew and ducted fan systems of aircraft propulsion are fully discussed in the Fourth Edition of *Gas Turbines and Jet Propulsion for Aircraft, by G. Geoffrey Smith, M.B.E.*

Rockets and Athodyds

The liquid rocket, at present inapplicable to bombers, may yet prove its value as a supplementary power plant for emergency performance. A special atom-bomb carrier with turbine-cum rocket or turbine-cum-athodyd propulsion merits contemplation; alternatively an air-launched rocket-propelled bomber might be developed on the lines of the D.F.S. 228 high-altitude reconnaissance machine, designed to protract its range by gliding and climbing. Consideration of more perturbing possibilities is outside the compass of this survey.



Some examples of jet-propelled army-support bombers. Top left is the Junkers EF 126 ("Elli") with an As 014 impulse duct, as used on the flying bomb. The twin-boom aircraft is the Blohm and Voss P 196 with two underslung B.M.W. 003. Construction of the Hs 132 (bottom left) was well under way and a prototype of the Me 328 (bottom right) had been flown. The Hs 132 has a B.M.W. 003 and the Me 328 used twin As 014.



German designers were seriously considering the possibilities of launching heavily loaded jet bombers from special aircraft. Their experience with "Mistel" composites would have been valuable in this connection.

Experience with *bona-fide* jet bombers being too limited for appraisal, it is worth-while to consider the achievements and possibilities of adapted jet fighters. In the last months of the war small numbers of Me262's carrying a 550-lb. or 1,100-lb. load, or two containers of anti-personnel bombs, made surprise attacks from low and medium levels. Their speed immunised them against interception and they achieved some slight success against troop concentrations. Jet aircraft, however, are not by nature amenable to improvisation, and to restrict c.g. displacement on the 262 it was necessary before bombing to use half an hour's fuel. External bombs reduced the speed by at least 60 m.p.h., but the carriers could be released with the bombs or jettisoned in emergency.

Projected 262's intended primarily for bombing would have had greater capacity. *Schnellbomber* I, for example, would take an externally-stowed PC1OORS rocket bomb weighing about a ton or a 1,400-lb. bomb-torpedo, while the Ia was similar but with the cockpit advanced to improve sighting view. *Schnellbomber* II would have had stowage in a ventral fairing for a one-ton load. At full thrust the estimated speed was 550 m.p.h. and endurance two hours.

Though acceptable for certain duties, these modified fighters would have been inadequate for raids demanding pin-point accuracy, and would have fallen short of present-day army requirements which postulate a specialised "front-line" bomber capable of low-level or diving attacks on small tactical targets. For this work strength, manœuvrability, heavy armour protection, good view and the ability to operate from small airfields are essential requirements, and bombs are usually complementary to a heavy gun and R/P load. The class is exemplified by the Typhoon bomber and the American XA-41. Naval parallels are the Firebrand and certain American single-seat "strike" aircraft developed along similar lines. Again it is necessary to cite a German example, for the Henschel Hs 132 is still the sole jet-propelled representative in the specialised close-support class. Of composite construction and with a "pickaback" jet unit, like the He 162, this small machine is stressed for 12g, the pilot lying prone in the nose to enable him to withstand the violent manœuvres allowed by this factor. A semi-internal bomb load of up to 2,200 lb. reduces the sea level speed of 500 m.p.h. by about 55 m.p.h.

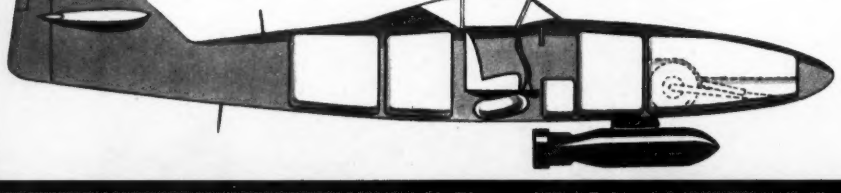
JETBER

Blohm and Voss, after a special study of jet-propelled close-support bomber aircraft, offered their asymetric P 179 with a single offset Jumo 004 and the larger twin-boom P 196, a 20,000-lb. aircraft with two B.M.W. 003's mounted side-by-side under the nacelle. Each boom housed a 1,100 lb. bomb.

Seeking a further application of the Argus 014 impulse duct used by the V-1 flying bomb, the Germans decided that the low-level army-support aircraft was best suited to its peculiarities—severe loss of thrust with height, high consumption and shattering noise. Two of these "stuttering athodyds" were fitted without great success to the Me 328, designed for 500 m.p.h. at sea level or 455 m.p.h. with an external 1,100 lb. bomb. Five hundred gallons of petrol were required for a 300-mile range. Extravagant consumption likewise thwarted the Junkers EF 126, another army-support machine resembling a piloted flying bomb and fitted for two anti-personnel bomb containers or twelve "Panzerblitz" R/P's, and two 20mm. guns. Again, external stowage reduced speed by 60 m.p.h.

America has long displayed a predilection toward specialised low-attack and dive bomber aircraft, but, if the adapted P-80 is excepted, is still without a jet-propelled army-support machine though the Convair XP-81, officially classed as a long-range fighter, suggests itself for development. The General Electric TG-100 turbine-airscrew in the nose and pure-jet I-40 in the tail should promote manœuvrability at low levels and comparatively low speeds, with adequate performance for a surprise approach and a high-speed breakaway. In common with all fast army-support aircraft the XP-81 would benefit from dive-brakes.

Elementary adaptation characterised the first conversion of the Me 262 for bombing. The aircraft as shown is still essentially a fighter.



Opposite in aerodynamic and structural conception, the projected Messerschmitt bomber P 1107 (above) was the outcome of intense deliberation and research by a firm acquainted with the potentialities of tail-less and semi-tail-less aircraft, while the Horten XVIII flying-wing (below) was offered in competition by a concern which had no experience in the construction of large aircraft.

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The speed, strength, manœuvrability, and good view for the pilot, which characterises the true close-support bomber, render it adaptable as a "strike" aircraft, but while pure-jet propulsion is feasible for land-based machines of this sort the XP-81 power-plant layout may be expedient for carrier operation.

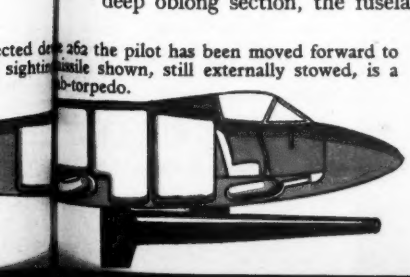
Between the specialised army-support bombers and strike aircraft and the largest long-range types (the so-called heavy bombers) is a class which embraces those outstandingly useful and adaptable machines arbitrarily termed light, medium or "attack" bombers. Typified by the Mosquito, Buckingham, Boston, Marauder, Invader and Ju 388 these are moderate in size, capacity and range, and stress the quality of speed. For our present purpose aircraft in this general classification will be referred to as medium bombers.

The jet-propelled medium bomber need be little slower than the defensive fighter, but attainment of adequate range may prejudice bomb stowage. Semi-internal or even external stores may be acceptable as an overload for certain duties, particularly if the bombs and exposed carriers are carefully faired, but the normal load must be internal. A crew of three (pilot, navigator/bomb aimer, and wireless operator/gunner) should suffice for normal day or night operation, and armament, if fitted, must be treated as an integral design feature and not as an extraneous variable; it will generally be limited to fixed or axially restricted rearward-firing, remotely-sighted and controlled guns of medium calibre, such as the improved 0.5 in. Browning M-2, or the new 0.6 in. gun. Control "boosters," thermal de-icing, pressure cabins, catapult seats, lacquered enclosures to reduce glare at altitude, and other refinements at present characteristic of jet fighters, may become the order of the day.

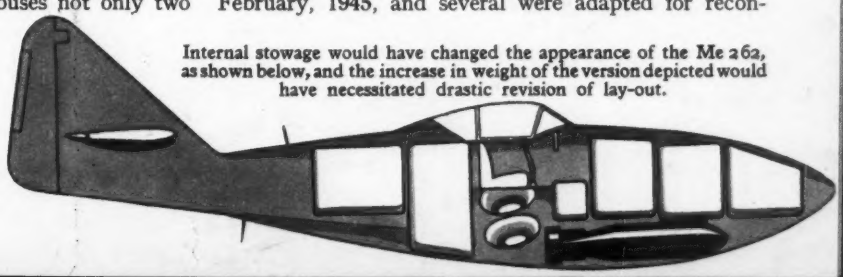
Other than the German Ar 234 and Ju 287 the only jet-propelled medium bomber in existence is the recently announced Douglas XB-43. The internal economy of this machine appears to be a model for designers. Of deep oblong section, the fuselage houses not only two gas turbine units with nostril intakes, but the rearward-retracting undercarriage, main fuel tanks and bombs, and permits a laminar-flow wing, unbroken by wheel wells and free of excrescences. The very antithesis of a flying wing, the XB-43 is a development of the 35,000-lb. XB-42 ("Mixmaster") which had two piston engines driving counter-rotating pusher airscrews. From this design the XB-43 doubtless inherits wing-mounted rearward-firing guns, but whether the bomb load—8,000-lb. on the XB-42—has diminished during transition to jet propulsion is still a matter for conjecture.

Incorporated in the pressurised crew compartment are "bug-eye" enclosures for two pilots and a transparent nose with bomb-sighting panel resembling that on the Fortress. Like all American jet aircraft the new Douglas is expected to exceed 500 m.p.h. A ceiling of 38,000 ft. and a 1,400-mile range have been mentioned.

If the XB-43 is considered as a counterpart of the Marauder then the jet bomber corresponding to the Mosquito is the Ar 234B, specimens of which have been flown with interest and profit in Great Britain and America. This was the first jet bomber with adequate bomb-sighting and stowage arrangements to become operational; 210 were built between June, 1944, and February, 1945, and several were adapted for recon-



...ected de... 262 the pilot has been moved forward to ... sighti... missile shown, still externally stowed, is a ...b-torpedo.



Internal stowage would have changed the appearance of the Me 262, as shown below, and the increase in weight of the version depicted would have necessitated drastic revision of lay-out.

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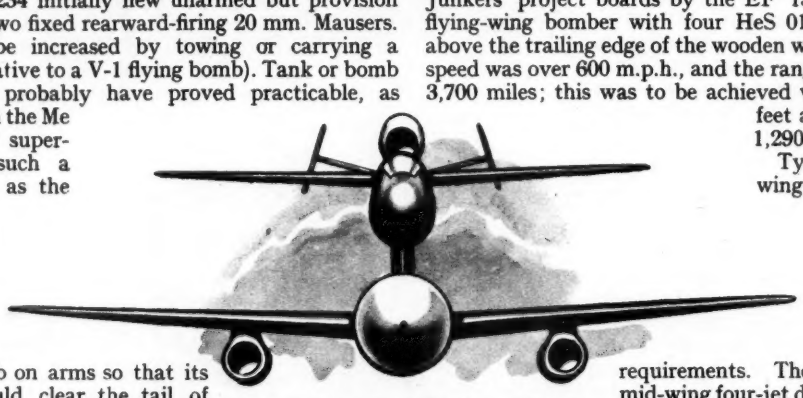
naissance. German figures show a top speed of 490 m.p.h. at 30,000 feet and a range of 880 miles and check tests at the R.A.E. gave only slightly inferior results. Farnborough further established that the general behaviour, except at take-off and landing, is good. A special periscopic sight is used for dive attacks with a semi-internal 1,100-lb. bomb under the fuselage. Supplementary bombs—two 550-pounders—are carried under the jet nacelles.

A later development, the four-jet 555-m.p.h. 234C, carried a 2,200-lb. fuselage bomb and was assisted on full-load take-offs by two 1,100-lb. A.T.O. rockets which reduced the run from 1,000 yards to 670 yards. Like the Mosquito, the 234 initially flew unarmed but provision was made for two fixed rearward-firing 20 mm. Mausers. Range could be increased by towing or carrying a tank (an alternative to a V-1 flying bomb). Tank or bomb towing would probably have proved practicable, as when tried with the Me 262, but a V-1 superimposed on such a small machine as the 234 suggests incipient trouble, particularly as it was necessary before launching to raise the flying bomb on arms so that its jet efflux would clear the tail of the 234.



"Mistel 5" was the designation of this jet-propelled Junkers composite which was to have a He 162 as the upper component and the specially designed Ju 268 as the explosive-carrier.

Less orthodox than the 234, the Ju 287, although still "medium" within our present definition, must be considered as the forerunner of all large jet-propelled bombers. The design is already three years old, and had Germany fared better the *Luftwaffe* might now have 200 of these useful machines. Two prototypes were built before work was stopped. With a 3-ton bomb load and powered by four Heinkel-Hirth O11 or six BMW 003 axial-flow gas turbines, the 287 was to cruise at nearly 500 m.p.h. and have a range of over 1,100 miles. The normal weight was 47,500 lb., but this was to be increased to 68,000 lb., giving a wing loading of over 100-lb./sq./ft. and a range of well over 2,000 miles with four tons of bombs. At this weight the take-off run, even with six A.T.O. rockets each delivering 2,650-lb. thrust, would be 2,500 yards, or with ten rockets 1,600 yards.

The 25-degree sweep-forward, for which the 287 is best known, was adopted primarily to avoid obstructing the bomb bay and not for aerodynamic reasons, though an incidental advantage over a swept-back wing was the superior lateral control afforded at low speeds. Eventually two of the big B.M.W. 018 axial-flow units each of 7,500-lb. thrust were to have been installed.

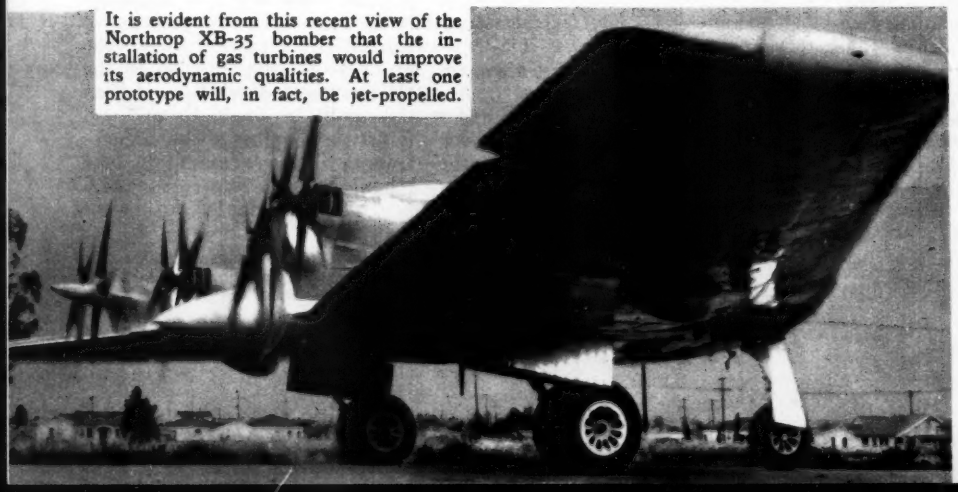
Flying Wings

Advanced as it was in technical conception and degree of development the Ju 287 was already superseded on Junkers' project boards by the EF 130, an 84,000-lb. flying-wing bomber with four HeS 011 units mounted above the trailing edge of the wooden wing. The designed speed was over 600 m.p.h., and the range without bombs 3,700 miles; this was to be achieved with a span of 79 feet and a wing area of 1,290 square feet.

Typical of the flying-wing jet bomber, the EF 130 contrasts with Messerschmitt's proposal for a machine to meet similar requirements. The Me P1107 was a mid-wing four-jet design with a bulky fuselage of circular section and a thin, swept-back wing. Various methods of mounting the jet units were considered; aerodynamically the most favourable was the scheme shown in the accompanying drawing with the intakes formed in the leading edge. Using the same power plant as the EF 130 and flying at the same weight the P1107 was to attain 580 m.p.h. Ten A.T.O. units would reduce the take-off run to a mile.

To meet the same specification Horten proposed the tailless wood-and-metal Type XVIII with four underslung Heinkel-Hirths and a fixed 8-wheel undercarriage, the fairings for which provided keel surface. Though its bomb load was the same as that of the EF 130 and the Me P1107, the Horten was a larger machine (span 98.5 ft., wing area 1,680 ft.) but weighed no more. Accordingly the landing speed, at 78 m.p.h. would have been lower and the service ceiling with bombs 42,000 ft. A pressure cabin housed the crew of four.

Most conventional of the projected German jet bombers in that it had outboard underslung units the Blohm and Voss P188, with its "W" wing plan was the most bizarre in appearance. The crew of two had a pressure cabin and one scheme provided for two fixed 20 m.m. guns firing astern and two remotely-controlled 13 m.m. guns in the tail. Beneath the main fuel tank was a bomb



It is evident from this recent view of the Northrop XB-35 bomber that the installation of gas turbines would improve its aerodynamic qualities. At least one prototype will, in fact, be jet-propelled.

bay for 8 × 550 lb, 4 × 1,100 lb, 2 × 2,200 lb or 1 × 5,500 lb. Henschel proposed a 620 m.p.h. bomber with wing-mounted units, moderate sweepback and no tailplane.

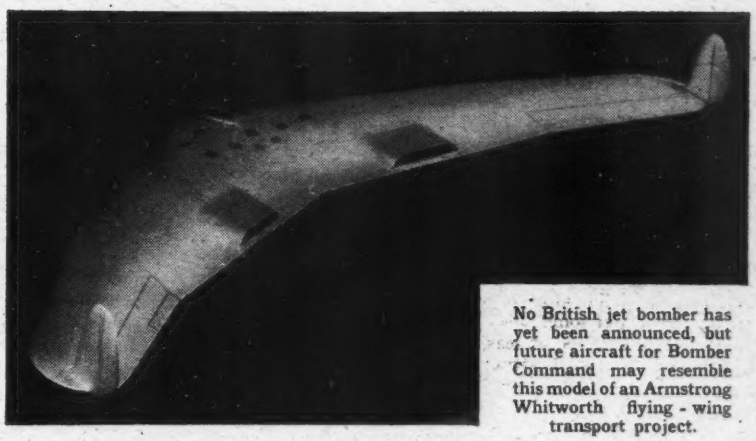
One of the most threatening problems attending the introduction of jet bombers similar to the foregoing is that of take-off. A particularly high wing loading has always been a characteristic of the fast medium bomber and this will persist and even be aggravated by the adoption of jet propulsion with its demand for heavy fuel loads. Other factors prejudicial to take-off performance will be the relative inefficiency of the pure-jet at low speeds and the handicap of a thin wing without the elaboration of boundary-layer control.

It has been seen that projected jet bombers would require batteries of powerful liquid-fuel rockets for overload take-off (6 or 10 × 2,650-lb in the case of a thirty-ton machine), an extravagant complication and a potential danger likely to prove unpopular alike with supply, maintenance and operation personnel. Assisted take-off must nevertheless play an important part in the operation of heavily loaded bombers and for the present at least the rocket seems to be the most acceptable solution.

Rocket thrust is not necessarily applied direct, but through the medium of accelerator gear, as used by the Royal Navy. The Naval accelerator at present launches aircraft of up to 16,000 lb at 73 m.p.h.

Composite Aircraft

Daimler-Benz planned to obviate the use of rockets by launching a jet bomber by a special tug, or more strictly, carrier aircraft, designed solely as a weight-lifter and powered by four, five or six piston engines or turbine-airscrew units. To provide clearance for the underslung bomber the fuselage was made very slim and the undercarriage fantastically "stilty," with a track of about 80 feet. A low wing-loading would enable the combination to use small airfields.



No British jet bomber has yet been announced, but future aircraft for Bomber Command may resemble this model of an Armstrong Whitworth flying-wing transport project.

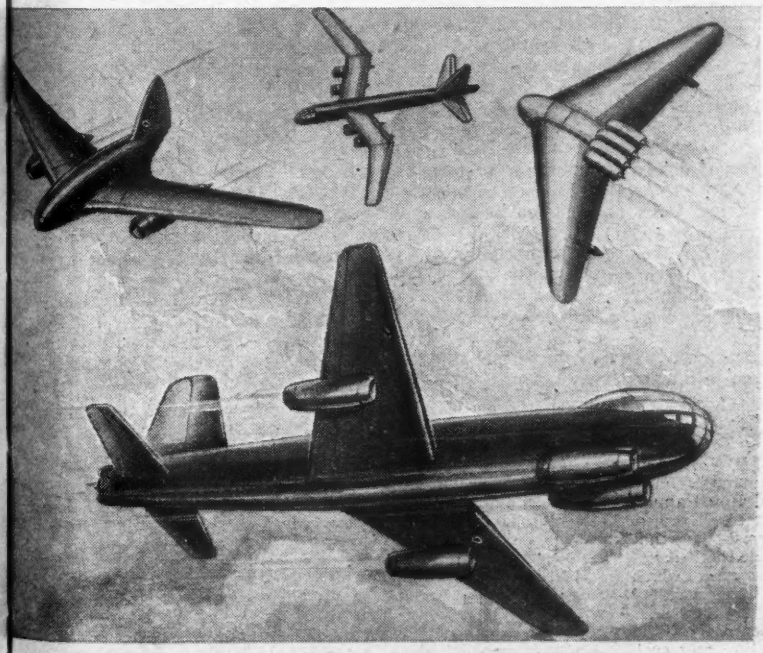
The mounting of a single jet above the bomber's fuselage of the Daimler-Benz bomber may suggest that this was to be a small machine, but the astonishing fact is that the designed weight was 150,000-160,000 lb and the maximum bomb load thirty tons. A projected D.B. turbine-jet of 28,000 lb thrust was to give a speed of 570 m.p.h. and the loading of the sharply swept-back 72-ft wing would have been over 100 lb/sq ft.

Certainly a jet bomber of this calibre was not to be expected in service for some years, but the launching scheme, backed by experience with *Mistel* composite aircraft, offered immediate possibilities. As used during the war, *Mistel* will be remembered as a pilotless Ju 88 with an explosive warhead, directed to its target firstly from a superimposed Me 109 or Fw 190 and, after release from this upper component, by an automatic pilot. That the scheme was designed merely to use up old bomber airframes is untrue; in fact Junkers had already designed a jet-propelled composite using a *Volksjaeger* as the controlling aircraft and the specially designed jet-propelled Ju 268 with a warhead of 7,700 lb as an expendable lower component.

It will have been gathered that the innate difficulties of classifying bombers as light, medium or heavy has been complicated by the advent of jet propulsion. Thus we have the Horten XVIII measuring nearly 100 feet and weighing 84,000 lb, and a Daimler-Benz project as small as a Marauder but weighing more than the 172-foot Northrop, or twice as much as a Lancaster. For our present purpose, however, the few types of jet bombers remaining will be considered as "heavies."

That a few aircraft in this class may initially be powered with turbine-airscrew units has already been suggested. Once more Germany provides an example—a B.M.W. project with two 028 turbine-airscrew units mounted on outriggers inclined at 45 degrees to the fuselage. The wing of this machine is swept forward like that of the Ju 287. A second B.M.W. scheme for a bomber called for two 018 turbine-jets and two 028 turbine-airscrews, the latter units driving 8-blade contra-rotating airscrews. Using the turbine-airscrews alone this 165,000-lb aircraft was to attain 400 m.p.h., and with the jets in operation, 500 m.p.h. A ten-ton bomb load and a range of 1,700 miles were calculated.

America as yet has no jet-propelled



Top, left to right, are projected jet bombers by Henschel (P.122), Blohm and Voss (P.188) and Junkers (EF.130). Two prototypes of the Ju 287 four-jet bomber (also shown in the above sketch) were completed.

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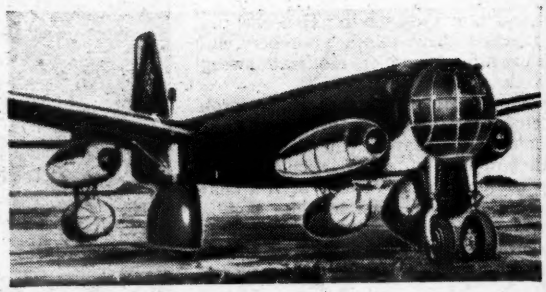
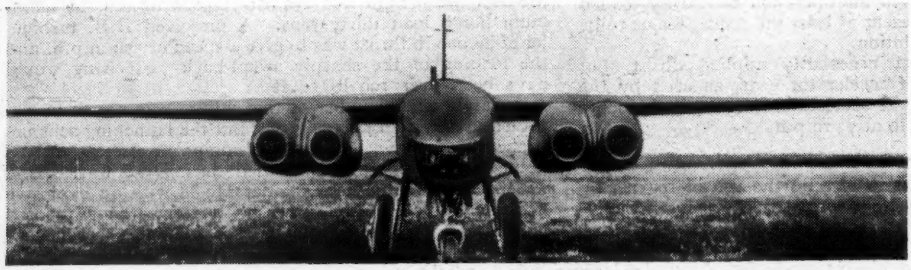
"heavy" bomber, though the modification of the Northrop XB-35 for jet-propulsion is proposed, and Martin has designed the six-jet XB-48. On one XB-35 Northrop Hendy gas turbines may displace the present Wasp Major piston engines, which drive 9-blade contra-rotating airscrews. The Northrop is additionally interesting because the disposition of its guns typifies a modern tendency in the arming of large bombers. The six remotely controlled barbettes, housing multiple 0.5 Brownings, are disposed above and below the wing and are so clean that drag should be little more than the 6 per cent at cruising speed claimed for the Boeing Superfortress, with its fuselage barbettes and tail position. For night operation the Northrop installation might be adapted for radar gun-laying, permitting defensive fire without visual contact.

The General Electric Company has considered the arming of a four-jet 120,000-lb bomber attaining its top speed at 0.72 Mach and having a ceiling of 50,000ft and a 3,500-mile range. The crew of four would be housed in a pressurised cabin. A nose and tail turret, each with four 0.5in guns are suggested. the sighting to be periscopic. A more equitable solution, however, would appear to be six guns firing astern and two forward; better still, all six guns might be concentrated in the tail.



Four bi-fuel liquid rockets in place under the jet nacelles of a Ju 287. The prototype shown has a temporary fixed undercarriage.



The Ar 234C with four BMW 003 turbine-jets grouped in underslung pairs. This was a fast and promising aircraft with adequate sighting and stowage arrangements.

It may be recorded here that the Superfortress which dropped the atomic bomb on Hiroshima was stripped of all fuselage barbettes, retaining only the tail position.

Though the Ministry of Supply and Aircraft Production has allowed advance publicity concerning new jet-propelled research aircraft and fighters, no word has been uttered on the subject of new British jet bombers. An experimental Lancaster is already being flown with two Rolls-Royce Nene turbine jets and two Merlin piston engines, and Dr. Hooker has calculated its performance with four Nenes. This hypothetical conversion is of particular interest in view of a report that the Russian TB-7 bomber (a type used in small numbers to bomb Berlin) has been fitted experimentally with turbine-jet units.

Dr. Hooker estimates that the four-Nene Lancaster, at an all-up weight of 60,000 lb, would cruise at 400 m.p.h. at all heights up to 35,000ft. Without adding to the standard tankage and with no allowance for drag reduction due to the elimination of the airscrews, the range would only be about 1,000 miles at 30,000ft or 500-600 miles at 10,000ft, but this could be increased by utilising the weight saving of 5,000 lb (the difference between the installed weight of the Merlins and Nenes) to carry more than 500 gallons of additional fuel.

The 20,000-lb take-off thrust of four Nenes is at least 25 per cent better than the present thrust given by four Merlins and take-off would be correspondingly improved. Dr. Hooker also makes the point that the range of the Nene - Lancaster would be fairly independent of forward speed, so that if the machine were uncomfortable at 400 m.p.h., speed could be reduced to 300 m.p.h. without appreciable loss.

British jet bombers of new construction may be expected to differ from hypothetical and projected transport machines lately mentioned by designers in operating at higher wing-loadings and having a smaller fuselage or stowage space, bombs being a denser and more concentrated load than fare-paying passengers. Furthermore, the power units may be operated at a special military rating, and if armament drag is suppressed to a minimum, and the bomb aimer's position is carefully designed, the speed should be appreciably higher than that of the corresponding transports.

In any case it is apparent that British pre-eminence in gas-turbine development, coupled with an energetic high-speed research programme, should not only maintain but enhance the superlative quality of Bomber Command equipment.

HONOUR FOR G.A.P.A.N.

BY honouring the Guild of Air Pilots and Air Navigators of the British Empire in becoming its permanent Grand Master, H.R.H. Princess Elizabeth has signified Royal appreciation not only of the work of the Guild, but of all professional flying personnel. Such practical interest does not in fact provide a new precedent. In 1936 H.R.H. the Duke of Kent conferred a similar honour by accepting this office, which has been vacant since his untimely death in a flying accident three years ago.

After the comparative inactivity of the war years, the Guild has now returned to an even more complete life, and such patronage could hardly have been conferred at a more opportune moment. The membership is expanding both in numbers and scope, and the work is increasing.

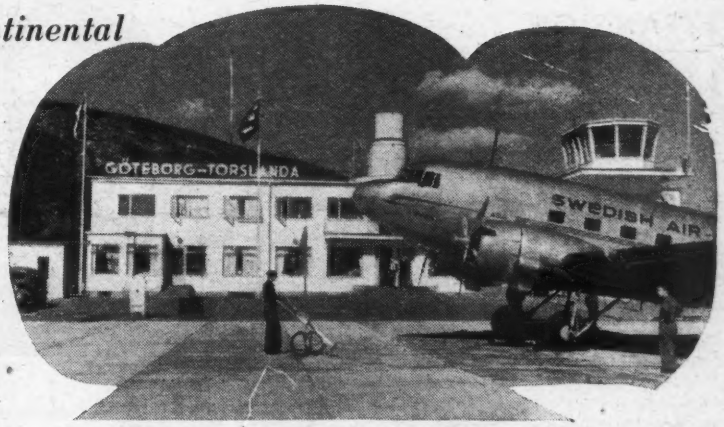
P.I.C.A.O. AND AIRFIELDS

THE influence of gas-turbine engines on the development of aircraft design, and the inevitability of weightier aircraft, will be considered by the Aerodrome Division of P.I.C.A.O. in drawing up the necessary specifications for airfields and auxiliary services.

A standard method of airfield lighting is necessary. Consideration is also being given to the need for non-visual ground aids for taxying on airfield movement areas in bad visibility. It is hoped that there will be as much attention given to flying-boat bases as to land airfields. There is a tendency in these days to think only in terms of runways. The Aerodrome Division of P.I.C.A.O. has resumed the work started last autumn at Montreal, and is once again under the chairmanship of Mr. J. R. K. Main, of Canada.

Work of A.B.A. and S.I.L.A. : European and Inter-Continental Plans : Story of the Fortresses

Swedish Expansion



On the Stockholm-London run both A.B.A. and B.O.A.C. make only one stop—at Gothenburg, which is Sweden's second most important city

NOT unnaturally, since of all European countries Sweden has been one of the least affected by war losses and damage, this country's air transport system has been, since the summer of 1945, developing very rapidly indeed. So much so that a word or two about the present position and recent history will be interesting.

Until June of last year all the more important air transport operations in and from Sweden were the responsibility of A.B. Aerotransport. In that month, however, a new concern, S.I.L.A. (Svensk Interkontinental Lufttraffik A.B.) made its first proving flight from Stockholm to New York. S.I.L.A. had, in fact, been formed two years earlier to look after all the country's ex-European airline work. In 1945, too, the chief of A.B.A., Capt. Carl Florman, notified the Swedish Government that the company would no longer require subsidy assistance, and the connection between the division of operational responsibilities and this fact is probably a direct one; obviously, long-distance trans-oceanic services are not likely, during the first period of operation, to pay their own way.

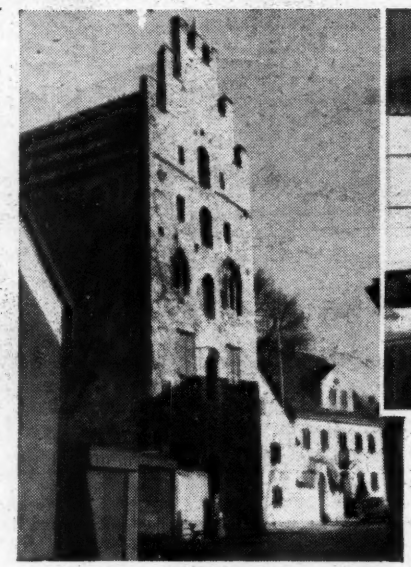
The chief pilot of Swedish S.I.L.A., Cdr. Marshall Lindholm. He is in the pilot's seat of one of the company's new Douglas DC-4s.

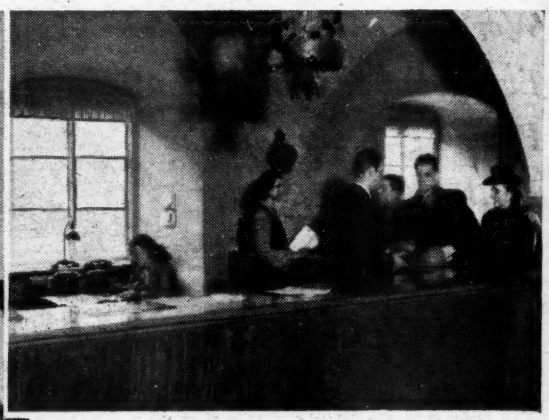
S.I.L.A. is at present operating the New York service, using converted Boeing Fortresses, almost entirely for mail carriage, and passengers are booked only in special circumstances. But the company has now taken delivery of six DC-4s, and during August the service should be increased in frequency and become normally scheduled for passenger work. Some of these DC-4s, incidentally, went into service on the European routes on July 15. The present Fortress schedule is weekly, and the aircraft usually take a route via Iceland and Gander. At the same time, S.I.L.A. is running a bi-monthly "priority" service to Addis Ababa, via Naples, Cairo and Khartoum, and later this year a regular service will be started across the South Atlantic to Rio de Janeiro. A proving flight, again with a Fortress, has already been made over this South Atlantic route.

The history of the converted Fortresses, which will continue to be used while they remain serviceable, is an interesting one. They were picked out from those U.S.A.A.F. aircraft which, after raids on Germany, were forced by engine trouble or damage to put down on Swedish soil. The Americans permitted Sweden to take over nine of them, and these were rebuilt at the S.A.A.B. aircraft factory at Linköping. Two of them have since been handed over to D.D.L., the Danish airline company, and two have been used for necessary "cannibalism."

Preparatory to taking delivery of Boeing Stratocruisers, S.I.L.A. will be using Douglas DC-4s for their Atlantic service. The experimental mail flights have been made with converted Fortresses.

SWEDISH EXPANSION





One of the more useful internal Swedish air services is that between Stockholm and Visby, on the island of Gotland. The company's traffic office in the capital has been established in a 13th-century manor house.

since no normal spares were available. During the latter part of the war, these rebuilt Fortresses assisted A.B.A's DC-3s in the special service which was running between Stockholm and this country.

Until the pre-invasion period, when all such services had to be temporarily banned, A.B.A. had made a total of 416 crossings of the North Sea, and apart from carrying 2,535 passengers, these aircraft had brought in a large quantity of special steel and ball-bearings.

During the last year of the war the only civil services operated by A.B.A. were those to Helsinki, Berlin and Malmö. As soon, however, as the war had ended, A.B.A. began to re-open their various European services and, apart from the various internal runs, the company is now operating regularly to Amsterdam, Brussels, Zurich, Lisbon, London, Nice, Paris, Prague, Rome and Warsaw. During the first half-year of post-war operations, the company carried a larger number of passengers than during the very best immediately pre-war years.

In June this year, the A.B.A.-S.I.L.A. combine possessed seventeen DC-3s, six DC-4s, and the five rebuilt Fortresses. Next year S.I.L.A. will be taking delivery of four Boeing Stratocruisers—and were, in fact, the second operating company in the world to place orders for these aircraft.

CIVIL AVIATION BILL PASSED

ON Monday, July 8th, the Civil Aviation Bill was considered on report. A long debate followed on the system that should be adopted by the Corporations for the employment of their staff. Major Vernon referred to the two methods in common use; the normal Civil Service entry examination, and the method customary with joint stock companies—that of selecting employees from acquaintances, or from applicants. The Government, he said, had to choose one of those methods, or to compromise.

The proposal was that an outside body appointed by the Minister and the Corporation should make the preliminary selection and offer recommendations. This clause was proposed in order to remove the feeling which existed in the lower grades that the higher appointments were filled by incompetent people. In support of the clause, Mr. Geoffrey Cooper gave the Service selection board as an example of the kind which might be expected to be successful. Air Cdr. Harvey complained that there were directors with no knowledge of civil aviation, whereas men with twenty to thirty years' flying experience were forced to resign with a small pension.

Mr. Ivor Thomas, in reply, said that he considered the pensions to be generous, but he would like to see some scheme by which pilots obtained administrative experience during their last years of flying and could then carry on in some normal job. He went on to say that the idea of tests for the appointment of members to the staffs of the Corporation made him shudder, and he asked what guarantee there could be that the boards would set the right tests. Mr. Thomas stated that B.O.A.C. and B.E.A., were, in fact, using an Appointment and Promotion Board.

The Attorney-General stated that the Government would give further consideration to the question of appointments, not so as to impose upon the Corporations an outside body which would be responsible for appointments and promotions within the service, but to consider whether there was any means of assuring and protecting the independence of the Corporations, at the same time ensuring that those people available for appointment within them were persons possessing the proper qualifications. Major Vernon withdrew the amendment.

Col. J. R. Hutchinson moved a clause to compensate private undertakings which had been forced out of business when the war began, and were now unable to start again because of nationalization and the provisions of the Civil Aviation Bill. This clause, the Attorney-General said, proposed to provide gratuities to those who happened to be concerned in civil aviation before the war, not because the Government was taking over or confiscating anything from them now, but, because, in 1939, they were prevented from continuing their activities.

Mr. A. T. Lennox Boyd said that the Government were cashing-in on the labour sacrifices of some dozen people who had made Britain air-minded at a time when it was going to be, for the first time, a profitable business. Sir Thomas Moore made a plea on moral grounds for compensation for the companies, but the motion was defeated. A strong appeal was made by him to reduce the maximum penalty for infringement of the Corporation's reservations. The Attorney-General explained that His Majesty's judges could be relied upon to make the punishment fit the crime, and it was not the "honest ex-pilot" who was the likely transgressor, but the "crafty, cunning financiers."

The Bill provides for the constitution of an Air Transport Advisory Council, and there is a proviso that the council shall not be required to hear representations from the public on matters regulated by an international agreement of which the Government is a party. Continuing the debate on Thursday, July 11th, it was proposed by Mr. Lennox Boyd that this proviso should be deleted. After some debate Mr. Ivor Thomas amplified the matter by stating that the exclusion did not refer to agreements between operators but to international agreements.

A further amendment was moved by Mr. Mikardo that members of the Corporations should be appointed in a full-time executive capacity only. Mr. Ivor Thomas, in defending the Bill, said that the Minister may appoint all the members of the board on a full-time executive basis, if he so wished, but the Minister believed that there were occasions where part-time directors might have a very desirable function and in which no full-time director who was available could do the work for him.

Mr. Ivor Thomas, in concluding the debate, said that he believed that the plan opened up a bright future for British civil aviation, and that our public Corporations would prove equal to any other undertaking in the world, and would open the way towards that internationalization of civil aviation which we so much wished to see.

CIVIL AVIATION NEWS

Constellations Grounded:
Anglo-Italian Agreement :
P.I.C.A.O. Meetings :
Government Landing Fees

"Flight" photograph

TRANSATLANTIC HOLD-UP

THE United States Civil Aeronautic Board has ordered all Lockheed Constellation aircraft to be grounded for thirty days, pending an investigation into a crash in which one of these aircraft was involved in Pennsylvania on Thursday, July 11th.

The effect has been the curtailing of many air services in the United States and an almost complete temporary paralysis of the majority of the transatlantic services. Skeleton schedules are being attempted by Pan-American Airways, using DC-4s, and every effort is being made to provide alternative travel for disappointed passengers. K.L.M., Trans-Canada Airlines and the B.O.A.C. Return Ferry services, on which other types are used, are unaffected.

It would appear that there had already been some suspicion in American circles of a fire risk in the induction system of the Constellations. This accounts for the drastic action taken by the C.A.B., and some definite modification in design is hinted. It is obviously the Board's intention to keep the aircraft grounded until all chances of a repetition are eliminated.

The affair has, of course, affected B.O.A.C.'s newly started Atlantic services, since the Air Registration Board has naturally supported the C.A.B. in their decision. Representatives of the Corporation will, it is understood, attend the enquiry, after which a final decision will be reached.

"Flight" photograph.

POST-PRESSURIZATION : Lord Winster, the Minister of Civil Aviation, followed by Sir Henry Self, Permanent Secretary to the Ministry, leaves the Tudor I after the demonstration at London Airport.

G.E.'S VADE-MECUM

FIRST published three years ago, the Air Registration Board's handbook on airworthiness requirements has recently been reprinted in a form modified to bring it into line with present practice. The information included is most difficult to obtain from official publications, and the handbook should be very valuable to holders or prospective holders of ground engineers' licences. It forms, in fact, a synopsis of requirements and information and is published by the Air Registration Board, Brettenham House, Lancaster Place, Strand, London, W.C.2.

B.S.A.A. BEGINNINGS

IT is sometimes interesting to remember how some projects are started. In the last stages of the war British Latin America Airlines was formed by the Royal Mail Lines and four other steamship lines, with the intention of operating an air service between the U.K. and South America. No subsidy was demanded and the company went ahead with the inauguration of the service, making arrangements for a proving flight as early as July, 1945.

When the policy of nationalization was announced by the new Government, the organization was, after negotiation, taken over and renamed British South American Airways, so putting to service the preparatory and pioneering work already done. It is to the credit of the shipping lines that no compensation for their labours was asked for. These facts were given recently in the R.M.L. chairman's report on the year's work.

MORE MARTIN ORDERS

TWO South American operators have announced the purchase of Martin transports. The first, Pan American Grace Airways, have placed an order for seven 38-passenger 303s, and the second, Dodero Air Lines, of Argentina, have ordered four 40-passenger 202s.

Panagra, incidentally, is now awaiting the delivery of Douglas DC-4s and DC-6s for use on its recently approved service from Balboa, in the Panama Canal Zone, to Buenos Aires. The Martin 303s will be used on the shorter runs, but, in order to increase the available range of the type, the estimated total take-off weight has been increased to 37,500 lb.

The Dodero organization, which is part of what is probably the largest shipping concern in Latin-America, has, it will be remembered, recently taken delivery of four of the five Short Sunderlands ordered. The purchase of the Martins will be the company's second major move in a post-war programme in which they will link inland towns with their shipping centres.

At the same time two more U.S. airline operators have announced their intention of purchasing Martin 202s. The first of these is Delta Air Lines, who have placed an order for twenty aircraft, and the second is Willis-Rose Airlines, who have ordered six freighters. The former operate from Atlanta and was one of the pioneer operating companies in America, while the latter is a non-scheduled freight transport organization which was formed by a group of ex-war pilots last October.

CIVIL AVIATION NEWS

SERVICE AT LYMPNE

SINCE the beginning of last week refuelling facilities have been available at Lympne airfield, which, for so many months, was somewhat derelict even if officially "open." These are being provided by Field Consolidated Aircraft Services, who can supply 73 and 87 octane fuel. As soon as accommodation has been arranged the services of licensed ground engineers will be available, with a stock of airframe and engine spares.

OFFICIAL PRESSURIZATION

LORD WINSTER, who had not previously flown in an aircraft fitted with a pressurization system, somewhat inevitably chose the Tudor I for his experience. Accompanied by his Parliamentary Secretary, Mr. Ivor Thomas, the Permanent Secretary to the Ministry of Civil Aviation, Sir Henry Self, and Air Marshal Sir William Coryton, the aircraft took off from London Airport, Heathrow, at 11.15 on Tuesday, July 9th, with the intention of climbing to 25,000ft.

As it happened, the climb was terminated at 18,000ft, owing to a technical hitch. Unfortunately, *Flight's* representative lost the seat ballot and was not able to fly in the aircraft. Personal experience of the minor failure which occurred would have been interesting. It appears that at 18,000ft smoke began to enter the cabin. The pilot, Sqn. Ldr. Cook, not being certain of the exact cause of the trouble, naturally lost height as quickly as possible and returned to Heathrow.

The fumes were caused by scorching which took place in the silencing fabric of one of the two cabin blowers. They were, in fact, a temporary discomfiture and were quickly cleared by the engineer, who opened the air-intake scoop. The silencing system on the two blowers, which is quite apart from the pressurized system as a whole, is still being modified. As it happened, the pilot could have continued the pressurized flight while using the second cabin blower only.

All of which—and particularly in view of the Press stories—was particularly unfortunate, since the Tudor I had previously completed a hundred hours' successful pressurized test flying. None of the passengers showed any signs of discomfort after landing.

THE ANGLO-ITALIAN AGREEMENT

ON June 27th we announced in *Flight* an air agreement with Italy, under which an Anglo-Italian airline company would be set up. The company will be known as Aerolinee Italiane Internazionali and will have a capital of 900 million lire (£1 million), sixty per cent of which will be subscribed by the Italian Government and forty per cent by British European Airways. If the Italian Government does not wish to take up its full share of the capital, not less than one-third of the remainder is to be offered for subscription in the first place by an existing company, Aviolinee Italiane, which operated services before the war. The British share of the capital is to be paid in sterling to the credit of the company's bankers in London, and the funds thus provided are to be used to acquire spare parts and other equipment in the U.K., and also to meet other expenditure here or elsewhere as approved by the Board. The terms provide that aircraft spares and equipment which cannot be obtained from Italian sources should be procured in the U.K. when available.

The company will operate services between Italy and other European countries, together with other external services which are of interest to Italy. Examples of routes definitely assigned to the company are those from Italian territory to the British Commonwealth, and from Italy to Greece, North Africa, Amsterdam, South America and France. In addition, the company is granted a certain number of routes previously operated by Aviolinee, and also a minimum number of internal routes which are essential to the commercial balance of the company's operations.

CHARTER OVERFLOW

WITH the present serious overcrowding at Croydon, at least two charter companies have been compelled to make temporary quarters at Kenley airfield. Meanwhile, they will, of course, use Croydon's navigational facilities and the operations will virtually be carried out from this centre.

The first of these, Westminster Airways, has, for the past few weeks, been operating from Heston, but as this is now largely a "contractor's airfield" and provides no flying control or similar facilities during the week-end, the temporary arrangement has not been very satisfactory. Heston will, in any case, shortly be closed for Heathrow-Northolt air-congestion reasons. Westminster Airways are at present using two Percival Proctors and an Airspeed Consul, while, for occasional operation, a Siebel light transport has been obtained and another Consul is on order. The Siebel Si.204 is possibly one of those which were built in France later in the war, and is a fairly conventional twin-engined aircraft with a maximum (in 204.D form) of 230 m.p.h. at 6,000ft. The engines are Argus As.411s, and as a trainer the Si.204.D carried a crew of two, five pupils and the necessary equipment, so presumably it will operate as a 6-7-passenger aircraft.

The second charter concern to move into Kenley is British Air Transport. This firm, in pre-war days, operated from Redhill and, during the war, from Kingstown, Carlisle, but Redhill continues to be under requisition, and it seems probable that B.A.T. will eventually move to Croydon when the accommodation situation there permits. B.A.T.'s present fleet consists of two Consuls and two Austers, with more Consuls on order.

THE P.I.C.A.O. ASSEMBLY

WHEN the three weeks of meetings of the First Interim Assembly of P.I.C.A.O. at Montreal ended recently, it would be true to say that, although they had proved extremely valuable in clearing the air on a number of important points which affect the permanent status of P.I.C.A.O., the meetings nevertheless produced no sensational results.

One of the important decisions, however, was that of referring back to the Council the task of revising the draft Multilateral Agreement. A full and frank discussion of this draft agreement had taken place, and this discussion brought out clearly the differences in the various national points of view. The decisions taken by the U.S. and the U.K. at Bermuda were thrown into prominence and it became clear that the Bermuda agreement commended itself to many members of the Assembly as a possible basis for a future Multilateral Agreement. The Council now has the task of revising the draft in detail on the lines of the various national points of view which were expressed.

A decision which involved several hours of discussion was that of selecting a permanent location for the headquarters of the organization when it comes into force as a permanent body after the Chicago Convention is ratified by the requisite twenty-six States. The claims of Montreal, Paris, Geneva, and even China, were considered, but, finally, twenty-seven votes, including those of the U.K. and U.S., were recorded in favour of Montreal, as against nine for Paris, four for Geneva, and only one for China. It did not seem that even the most eloquent appeals for this or that site influenced the result. In fact, the majority of delegates voted apparently on instructions from their Government, but the fact that the U.K. delegation was in favour of Montreal may have turned the scale in favour of Canada, as a venue, rather than Europe.

Another important matter was the filling of the seat which had been kept open for Russian participation. The United States supported by China, was in favour of Eire for this vacant seat and so it proved, for, in the voting, thirty-two States were in favour of Eire, compared with six for the Argentine, and one for South Africa.

The question of providing, operating and maintaining all facilities for communication and ground aids on international air routes formed the subject of an instruction to the Council to study the possibility of P.I.C.A.O. sponsoring for the purpose an international agency which could be supported by member States. It was also left to the Council to consider whether international civil air transport is capable of paying economic rates for any air navigation facilities and services which might be provided. The recommendations of P.I.C.A.O. for Standards, Practices, and Precedures were considered, and the Assembly decided that these should not be made legally binding yet, in view of the speed with which international air transport is developing and expanding.

The application of Greece for financial aid towards its international airport was considered, and the Assembly decided that contributions either in cash or in kind should be agreed among interested neighbour states.

With the approval of P.I.C.A.O.'s budget for 1946-47 at 1,960,000 dollars, and the scale of contributions towards this figure by member States, the amount which will be contributed by the U.K. was fixed at 196,000 dollars, whilst the highest contribution will be that of the U.S., at 294,000 dollars.

CIVIL AVIATION NEWS

INDIAN COMPANY RE-FORMS

THE Indian Air Line Company, Tata Air Lines, which has been operating continuously for some fourteen years as a department of Tata Sons, Ltd., is being re-formed as a public company under the name of Air-India, Ltd. The new company will have an authorised capital of 50 million rupees (£3¾ million), and shares to the value of 15 million rupees are being issued. The company at present uses DC-3 aircraft to operate regular services from Bombay to Karachi, Delhi, Calcutta, Madras and Colombo.

STATE LANDING FEES

THE rates to be charged at State-controlled airfields for landings have now been published in a *Notice to Airmen*. Interestingly enough, these figures vary according to the surface of the airfield, the landing charges for runways being nearly twice as high as those for grass.

The owner of an aircraft with an all-up weight below 1,200 lb, for instance, will be charged 3s 9d for landing on a grass airfield, and 6s 3d for a landing on an airfield "with hard runways." At the other extreme, the charges for single landings by a 30,000 lb aircraft will be £3 7s 6d and £5 12s 6d respectively. No fees will be charged for necessary test flights, and exemption will be accorded to Service, Ministry and diplomatic aircraft.

RELEASE OF AIRFIELDS

AS we mentioned some time ago, Mr. Gandar Dower secured the Debate on the Adjournment in the House of Commons on July 1st, and raised the question of the release of requisitioned airfields, and the necessity for dealing with claims arising from these requisitions as soon as possible. In reply, the Under-Secretary of State for Air, Mr. de Freitas, said that the Air Ministry had requisitioned approximately sixty pre-war airfields. Twenty of those had been transferred to the Ministry of Civil Aviation and good use was still being made of the remainder. For example, fourteen were in use for flying by the R.A.F., and were also open for charter and private flying; another sixteen were used as civil schools for flying training, and a small number were used for storage. Of these last, there were two on which the actual runways themselves had been used for storage. He agreed that the release of the airfields was desirable, but there was enormous pressure on storage space, of which 14 million sq ft belonging to the R.A.F. was used by departments other than the Air Ministry.

The Under-Secretary gave an assurance that the Air Ministry was constantly being pressed by various interests to de-requisition these airfields, but it was not doing so for the moment because, very shortly, it was hoped to announce exactly which airfields were required by both the Air Ministry and by the Ministry of Civil Aviation. On the subject of compensation, Mr. de Freitas said that the Compensation Act of 1939, the Requisitioned Land and War Works Act of 1945, and the appeal system to the General Claims Tribunal, were quite clear, and offered enormous safeguards for the operators.

BREVITIES

Royal Dutch Airlines will start a twice-weekly service on July 22nd between Amsterdam and Glasgow. The services will operate on Mondays and Fridays.

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A Paris-New York service is now in operation by Air France. DC.4s are used and the service calls at Shannon *en route*.

* * *

Although charter services will be allowed to operate from Turnhouse, the amount of accommodation available for such services will be severely limited for some time to come, according to a recent reply in the House.

* * *

The appointment is announced of Mr. George Burdick as Assistant to the European General Manager of American Overseas Airlines in London. Mr. Burdick served with the R.A.F. during the war and was seconded to B.O.A.C., for whom he acted as Assistant to the Regional Divisional Superintendent of the West Atlantic Division in Baltimore.

* * *

A new Air Transport and Navigation Bill was introduced in the Eire Dail on July 2nd by the Minister for Industry and Commerce. Among other things, the Bill provides for increasing the capital of Aer Lingus and for giving legislative effect to the Anglo-Irish Air Agreement and to the Convention signed at Chicago in December, 1944.

The service between Glasgow and the Isle of Man, which was suspended in 1939, was resumed on July 15th. Two services are being operated every week-day in each direction, with three services on Saturday.

* * *

Mr. M. Stuart-Shaw has been appointed manager for B.O.A.C. at Shannon airport. He was operations superintendent at Foynes for the Corporation between May, 1944, and May, 1945.

* * *

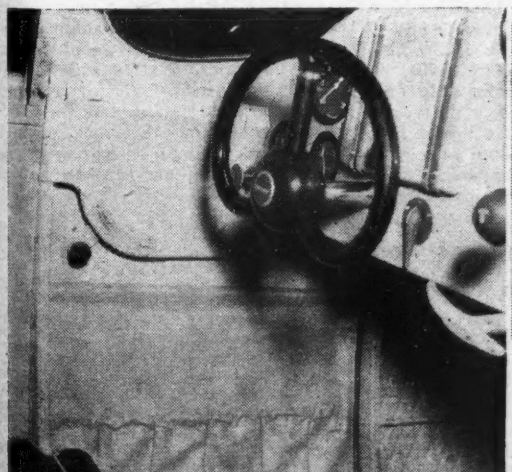
Following the first production D.H. Doves, which are being shipped to Canada and Australia, the next four aircraft will be going to B.O.A.C., Sudan Airways, Skyways and Central African Airways. The production rate will have increased to one a day before next spring.

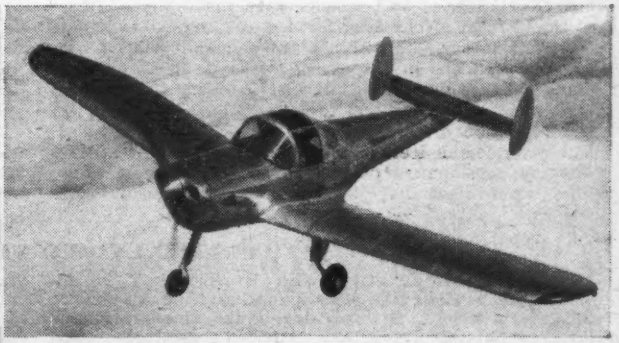
* * *

Since July 1st the Glasgow terminal for R.A.S. and S.A. passengers has been at St. Enoch Station, whence all coaches leave for Renfrew.

* * *

Using the name Santa Fe Skyways, the American railroad company of this name has formed an airline, with a terminal centre at Wichita, Kansas. Two surplus Douglas C-47s have already been purchased for initial operations, which will be limited to services in the territory served by the railway.





LATEST ERCOUPE: The post-war production version of the Ercoupe, of which more than a thousand have now been manufactured. As will be seen, this new model has been considerably cleaned up, while retaining the features around which the design was originally developed—those of simplified control. In the Ercoupe the rudder pedals have been eliminated, and the ailerons, rudder and nose-wheel movements are mechanically co-ordinated.

American Newsletter

Service Merger? : Controlling the Rocket : The British Air Attaché : Atlantic Troubles

By "KIBITZER"

FOR the last six months bitter arguments, waged with the fervour usual to such public debates over here, has swirled around the proposed merger of the U.S. armed forces. The idea that all three Services should become a co-ordinated whole is not entirely popular. The Navy has opposed such a move with all the skill, stubborness and parliamentary lobbying at its command. The Army, on the other hand, is equally vociferous in pressing for such a measure. The Air Corps, with little chance of being any worse off, is crying aloud for a separate Air Force divorced from both the Army and the Navy. At present, of course, the U.S. Navy has its own Air Service, while the Air Corps is part of the Army.

What the end will be is anybody's guess, but it is likely that, whatever happens to the individual Services, whether Army, Air Corps, Navy or Marines, a joint Defence Board and probably a Ministry of Defence will be created.

At the same time a second and, in some ways, more bitter fight is developing behind the scenes. This is the struggle concerning the development control of the guided missile in its various forms. The Army think that it should be handled by them, and the Air Corps claim that it is a matter for the flying people. The Navy appear to be going ahead with the intention of controlling their end of it irrespective of anyone else.

So far, the public in general has been unaware of this tug of war, but, as no "holds" will be barred, it can only be a matter of time before the subject comes out into the open. Newspapers will then be in it up to their necks, and will publish a great deal of pseudo-technical nonsense, so that the real issues are more than likely to be clouded over as far as the general public are concerned.

Inter-Service Rivalry

Merely as a matter of personal opinion a fight between the various Services for the control of an instrument of war seems to be foolish. The air is now recognized to be the primary medium of attack and defence on land or sea. Why, therefore, should the entire control either of aircraft or of airborne missiles be the baby of any particular Service? Such a monopoly has no real historical precedent. When the crossbow gave way to the musket, or the cannon ball to the high explosive shell, or the horse to the tank, only local Service adjustments were made to take care of the change. No special Service was created to handle these innovations. Surely each arm should develop its own airborne weapons in accordance with its needs—perhaps under a Governmental, or inter-Service, department which is able to see the whole picture.

Competition of this kind can only do good. An excellent example of the effect of such competition in the States was the development of jet fighters by the U.S. Navy. These would never have been promoted with such energy if this Service had not been trying to catch and, if possible, surpass, the performances obtained by the U.S. Army from the P.51, P.47 and P.80. At the end of the war the Navy had prototype fighters with an expected performance actually better than that of the P.80.

One is not advocating the abolition of the Air Forces or their merging into the land or sea forces. They are, perhaps, even more necessary as separate Services than the others, but it is suggested that both the Army and the Navy, whose requirements will be so different from the Air Force's and from one another's, should develop their own air arms to their own specific requirements.

* * *

The news that Mr. Peter Masefield, the British Civil Air Attaché in Washington, is to return to England has been received here with considerable regret by the Americans and with regret, mixed with apprehension, by those connected with the British aircraft industry. Only those who have had the opportunity of seeing the work at close quarters can realize the toughness of the job taken on by the Civil Air Attaché in the States. Outsiders are apt to consider it to be a sinecure consisting only of social activities.

Nothing could be farther from the truth. If the job is done properly, that is. It is never finished, and a cocktail party is probably the scene of harder work than the office. There is little or no relaxation and a great deal of travelling. It requires an excellent knowledge of the aircraft industries of both countries, as well as a good working knowledge of technical matters. It needs tact, diplomacy and, above all, energy. Furthermore, as in the case of so many such appointments, it is liable to be expensive for the holder.

But, despite all this, if the work is done well it can be of the greatest assistance to the British aircraft industry, and, at the same time, to the Americans. Exchanges of information should not be a one-way traffic. Nobody would suggest the premature divulgence of trade programmes or secrets, but more good can be done by exchanging useful information than by locking it away in the safe. The other fellow always finds out in the end, anyway. It was certainly on this basis of free exchange that the most successful wartime liaisons were founded. Let us hope that this can continue.

* * *

There has been some criticism lately of the poor schedules kept by some of the Atlantic operators. Machines have been unreasonably delayed by mechanical troubles, and the writer has met one or two disgruntled passengers. This is probably one of these unfortunate runs of bad luck which plague all forms of transportation, but there is a chance here for B.O.A.C. to continue that most enviable record of reliability which was built up with their Boeing Clippers. Whether the Constellations can do as well remains to be seen.

COURTNEY ON FLYING BOATS

CAPT. FRANK T. COURTNEY is remembered in this country as a test pilot of exceptional skill and as a staunch advocate of flying boats. Writing in the American journal *Air Trails* Capt. Courtney raises a number of points concerning design of future flying boats which are of particular interest if reference is made to the photograph on page 63 showing a model of a projected British boat on test at the R.A.E. He foresees a flying boat not so much in the accepted sense, but rather as a water-based aircraft designed to take the maximum advantage of undercarriage weight saving. For commercial work at least, he suggests that the machine should be designed to take-off and manœuvre on smooth water; for landing and "riding out" safely on rough seas the percentage of additional weight is, nevertheless, extremely small and not to be compared with the weight necessary to permit manœuvring and taking-off under the same conditions.

A drawing accompanying Capt. Courtney's article shows a machine with at least one feature noted, "figure 8" or "double-bubble" hull section also, in the design of the R.A.F. model. A streamlined main step, unusually clean bow lines, retractable chines, retractable "spray strips" in the bow, and retractable stabilizing floats are all mentioned. Capt. Courtney maintains that a keel is not essential, nor is it necessary for the tail to be carried high out of the water.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

MORE ABOUT APPRENTICES
Three Reply to Two

THE correspondence page of *Flight*, June 27th, was interesting. The chances of a few airmen may have been diminished, owing to overseas service, but "Two Ex-Brat Sergeants" were unwilling to take a chance by accepting engineer commissions. They, stout fellows, wanted security, would risk nothing to obtain it, and are unworthy of permanent commissions and Cranwell College. Civvy Street is to our taste.

THREE EX-BRATS (DEMOBBED).

HEADS I WIN . . .
Charter Services and the Law

I WAS very interested in your leader "Heads I Win . . ." (*Flight*, June 27th), but may I be permitted to doubt if the position is quite as obscure as you suggest.

The wording of the Act quoted by you, I agree leaves much to be desired, though surely the operative part is not the word "regular," but the expression ". . . and operating in such a manner that it is available to members of the public?"

My personal interpretation of this is that it is illegal for me, as an aircraft operator, to advertise a particular flight, at a specified date and time, from, say, Birmingham to Blackpool, and invite members of the public to buy seats on that flight. If a member of the public comes to me and hires an aircraft to do the same flight carrying passengers nominated by him, that is a private charter and legal, always provided that he does not invite his passengers to buy seats from him for the journey.

The case you cite of a travel agency hiring an aircraft and then advertising for passengers, is to my mind, quite illegal. The justification of such an action could only be . . . "Well, we do not actually own the machine in use" . . . which is obviously absurd.

In other words, you may charter an aircraft from me to go where you will, and you may take as many passengers with you as the machine will carry, but you may NOT share the cost of the charter between them.

The question of organizing a return load is limited by the same principle. If I fly from Birmingham to Jersey and want a return load, I CANNOT tout for passengers from the public. Nevertheless, if I have a branch or agent in Jersey, and advertise "aircraft for hire," there is nothing to stop my branch or agent chartering the aircraft to an individual on the conditions mentioned in previous paragraphs.

May I make it quite clear that the foregoing are my personal views, and as such may be erroneous. They are based on a certain amount of experience of the law relating to "contract hiring" of road vehicles, but I would very much like to hear the views of others interested in this very important point.

D. G. DUVAL
(*Duval Aviation Services*).

NOVEL ENGINE DESIGN
High Efficiency Without a Blower

I HAVE evolved a type of sleeve-valve engine which, in theory, shows great advances on the present-day light aircraft engines. I believe it would be a worth-while proposition to develop for use in personal aircraft of the lower powers and cruising speeds. It will allow the use of paraffin while retaining a high expansion ratio, and a novel type of exhaust allows excess powers to be obtained without raising cylinder pressures, r.p.m. or fuel consumption.

Briefly, my engine departs from convention in two ways. First, the mixture is ignited by the cylinder head being lowered at the correct moment and thus increasing the compression ratio and temperature. Secondly, while retaining the cylinder head in the lowered position, it is possible to exhaust the gases at about 90 deg crank-angle without lowering the expansion ratio. If, then the exhaust is retarded towards 180 deg, the expansion ratio is increased, the power fraction of the total stroke is increased, and thus greatly enhanced power may be obtained. At the same time, no extra fuel is burned.

These ideas are well suited to the two-stroke principle. The performance and characteristics would resemble those of a fully supercharged four-stroke, but although the weight of the supercharger would be eliminated, the power lost in compression would be greater and would thus more or less balance. Using these mechanisms, the two-stroke could have the volumetric efficiency and thermal problems of a blown four-stroke. Its two greatest advantages are the use of paraffin, and the saving in fuel at powers above economic cruising.

The cycle would be as follows:—

(i) Piston at b.d.c.; cylinder full of paraffin/air mixture; cylinder head in raised position.
(ii) Piston rises to t.d.c.; compression ratio 5 : 1, or maximum compression with paraffin.
(iii) Head is lowered, thus raising compression ratio to 12 : 1 and igniting mixture.
(iv) Piston starts on power stroke.
(v) At 90 deg crank angle, exhaust opens; expansion ratio thus 6 : 1.
(vi) At or about 180 deg, cylinder head rises and inlet port opens.

Stroke and cycle repeated.

For extra power, the exhaust would merely be shifted toward 180 deg. The throttle could thus be made to be at its maximum position at cruising power. An "accelerator" moving the exhaust and a choke similar to those used in automobile practice could then be utilized.

I think these ideas are worth while developing and I have provisionally patented them.

J. R. LAWSON.

FLIGHT OF BIRDS
Evidence in Support of the Aerodynamic and "Strongest Leader" Theory

ON reading through my previous letter, it appears to be appallingly arrogant! I can only give the evidence on which I based it, and beg the pardon of Mr. Yeatman and others for so appearing to pontificate. First, my statement that the reason for the formation is aerodynamic is based on my own observation of the rate of wingbeat, which appears to drop when a bird enters formation, and rise when it falls out. I think it is reasonable to conclude that there is thus some aerodynamic factor at work, although why *this particular* formation is chosen I cannot say.

Secondly, support for the "strongest leader" theory came from hunter's reports on the size and condition of birds brought down from different stages in formation. My actual source of this information was that of works on shooting. Thirdly, my statement on the spinning of birds was a result of watching their behaviour, particularly that of sea-birds, at and after the stall. Anyone who has watched a gull land will have no doubt that the bird is in perfect control well after the stall. Control problems as applied to aircraft obviously become inapplicable when our gull begins its few short flaps after the stall and just before touching down! The particular theorems involved I leave in all confidence to Mr. Yeatman, since my statement was merely in reply to letters in which the writers appeared to regard the flight and control of birds as being identical with those of aircraft.

A. R. FORREST.

SPEED AND THRUST
Four Points Clarified

WITH reference to "Brown Job's" letter published in *Flight*, June 20th, I wish to attempt to answer his queries.

1. Why jet engine capability is measured in lb thrust and piston engine capability in horse-power?—The main reasons for this are convenience, e.g., simplicity of measurement, aircraft designer's requirements and the inherent characteristics of each power unit. On test the jet engine's capability is simply recorded by means of a balance (i.e., thrust) and that of the piston engine by means of a brake (i.e., b.h.p.). However, when considering an airscrew turbine jet engine it is usual to refer to the total equivalent b.h.p. This is the summation of the airscrew turbine b h.p. and the equivalent jet b.h.p. Under static conditions the latter term is defined as the jet thrust divided by a predetermined factor. Under forward speed conditions it is the jet thrust h.p. divided by airscrew efficiency.

2. Development of power when aircraft is stationary.—The principal of drive for an aircraft fitted with either a jet or piston engine is exactly the same. In the former case it is the change of momentum of a small mass of gas travelling at a high velocity, i.e., the jet, and in the latter case it is the

CORRESPONDENCE

change of momentum of a larger mass of air travelling at a lower velocity, i.e., the slipstream. Hence, though the aircraft is stationary, a thrust can be exerted on it by virtue of the relative velocity of the jet or slipstream.

3. Torque resistance to motion of a jet engine rotor.—In a simple jet engine about 90 per cent of the power developed by the turbine is absorbed by the compressor in compressing the air. You will now realize why at quarter throttle (the figure quoted in your letter) you will not fly off to top revolutions.

4. Zero speed—zero thrust.—The thrust of the airstream is definitely equal and opposite to the total drag of the aircraft for a constant speed. At take-off, however, the thrust for zero speed can vary from zero to a value equal to the sum of the air resistance and the frictional resistance between the wheels and the ground. No doubt in your reasoning you were neglecting the latter term in this static friction case.

C. N. HAWKINS, B.Sc., Wh.Sc., A.C.G.I., G.I. Mech.E.

Power Supplied in Different Forms

IN *Flight*, June 20th, "Brown Job" wants to know why the outputs of jet and piston engines are measured differently.

A piston engine supplies power as *torque in a rotating shaft:*

Power = Torque × Angular Velocity.

A jet engine supplies power as the energy of a moving mass of air, the energy being obtained from fuel burnt in the air.

From thermodynamic considerations it can be shown that the efficiency is much enhanced (and the fuel consumption correspondingly reduced) by compressing the air before combustion. It is true that there must be a torque in the shaft to overcome the air forces on the compressor blades, as with an airscrew, the above equation applying in both cases, but the power required is "tapped off" from the energy of the gas stream as it passes through the turbine, only the residual energy being available for use in the jet. The residual energy clearly bears no relation to the power in the shaft, and, therefore, there is no shaft power output to measure.

Jet thrust, however, can be measured directly as the force on the engine mounting; and here the properties of a jet and an airscrew are analogous. If a jet engine and a piston engine plus airscrew were each put in a box with a hole at either end, the overall effect of each would be fundamentally the same, according to the equation:

$$\text{Thrust} = \text{Man per Sec.} \times \left\{\begin{matrix}\text{Jet Speed or} \\ \text{Slipstream Speed}\end{matrix}\right. = \left.\begin{matrix}\text{Box Speed or} \\ \text{Aircraft Speed}\end{matrix}\right\}$$

The reason why piston engines are not rated in thrust is that there is no thrust until an airscrew is fitted, and then the thrust depends on the efficiency of the particular airscrew used. The maker is, therefore, required only to say what his engine alone will do, the rest being left for the aircraft designer to work out.

With regard to "Brown Job's" final reasoning, he has forgotten that the drag of a stationary aircraft "revving-up" is provided by wheel-brakes and chocks.

As a note I would like to add that the actual power in the efflux from a jet engine is the sum of the kinetic energy exhausted per second plus the heat energy exhausted per second by virtue of the temperature of the gases above that of the surrounding air. This is not the power available, as all of the heat energy is lost and also some of the kinetic energy as long as the jet speed relative to the aircraft is greater than the aircraft speed. E. A. BRIDLE.

Piston and Jet Engine Compared

"BROWN Job" (*Flight*, June 20th) appears to have caused some of his trouble by considering only aircraft installations, which are concerned primarily with the thrust available for flight. On the jet turbine engine installation his argument on thrust horse-power is correct and it is equally applicable to a piston engine/propeller installation. The difference is that a piston engine produces power in the form of shaft (brake) horse-power which can be developed and measured on a test bed, whereas a jet turbine produces only thrust.

On the piston engine installation the airscrew is necessary to convert the torque (shaft) horse-power into thrust and thrust horse-power, the efficiency of the airscrew being the ratio of thrust horse-power to torque horse-power. As "Brown Job" states, the thrust horse-power is thrust times forward velocity The torque horse-power is shaft torque times angular velocity. $\frac{(\text{Torque} \times 2\pi \times \text{r.p.m.})}{33{,}000}$. Just as the thrust horse-power is zero at zero forward speed, so the airscrew efficiency is zero at this condition although the piston engine may be developing maximum (torque) horse-power.

Reference to the internally absorbed power is apt to confuse the argument on thrust and useful power. In this respect, however, both types of engine are similar. Both have friction at running surfaces to overcome, which requires power; both have accessories to be driven and most piston engines have a supercharger which can be compared with the compressor of the turbine engine. The power used in this way, however, does not form part of the useful power and does not directly affect the thrust horse-power in which "Brown Job" is interested. G. N.

USING GERMAN TECHNICIANS

Why Not Attach Them to the Ministry of Supply?

RECENT paragraphs in the Press concerning the employment of German prisoners of war in the War Office, and the resulting explanation from an official that, owing to their knowledge of the particular work, they would be more useful than civil servants, prompts one to suggest that perhaps this scheme could be applied with advantage to the Aircraft Production Branch of the Ministry of Supply.

The Ministry at present consists of a nucleus of officials with little or no practical experience, surrounded by a host of civil servants who have no qualifications for the job they do, other than a limited repertoire of stock phrases for indirectly saying "no," a positive genius for obstruction, and who, after some time in the department, are referred to as technical experts. With long standing the higher officials achieve the status of oracles, and can then use academic jargon and new phrases and terms coined at their convenience or need, to overawe Royal Air Force officers whose technical qualification quite often consists of an R.A.F. engineering course taken some long time ago, and who are appointed for relatively short periods to "control" official activities.

As it has been stated on the highest authority that officially the R.A.F. depends entirely on the advice of the Ministry, it is surely time that those who have consistently shown their lack of vision, and have so resolutely resisted new ideas in the past, should be removed, retired, or promoted out of the way in the usual manner.

Otherwise, without the urgent necessity of war to force the trial of new ideas—and, indeed, the adoption of developments which have already been proven in practice—we shall find ourselves facing the future with equipment of a similar class to that which frittered away value personnel, man-hours and material in the early stages of this last war.

Great men have publicly given assurances that all steps would be taken to ensure against the recurrence of a similar state of affairs, and if, after the weeding-out process is complete—and our own talented scientists and technicians do not desire to remain under Ministry control while others still feel that initiative will be stifled—then one answer would be to employ, within the Ministry rather than at other centres, the German scientists brought to this country.

These men have most effectively demonstrated their foresight and ingenuity, although hampered by difficult conditions and paucity of materials. J. R. ANDERSON (ex-Flt. Lt.).

MAN'S INGRATITUDE

Even Disabled Airmen are Ignored

THE letter by "Man-in-the-street" (*Flight*, May 23rd) was confirmed by an experience of my own last week.

Walking back from the centre of the town to the Rehabilitation Unit, one evening, after missing the last bus, I "thumbed" six cars before giving up the attempt. All had empty seats; none stopped, although it was raining slightly and I walk with a fairly pronounced limp when tired.

The unit is very well known in the town, and it is common knowledge that it consists of disabled aircrew. Nevertheless, since the end of the war, incidents such as this have become the rule rather than the exception. T. V. ARDEN, Flt. Lt.

FORTHCOMING EVENTS

July 21st.—Leicester and Auster Flying Clubs Rally, Rearsby Airfield.

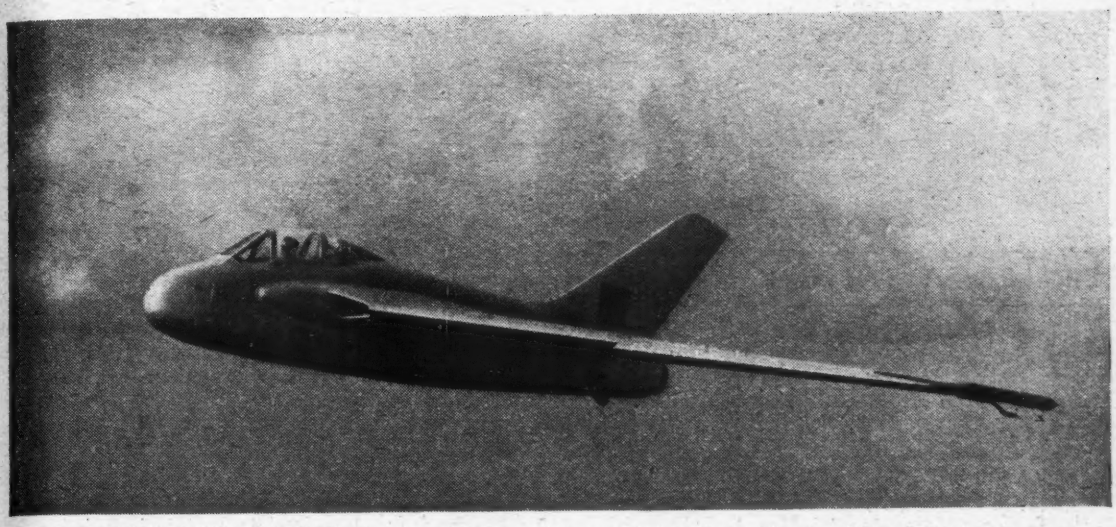
Aug. 22nd.—Model Engineer Exhibition opens at the New Horticultural Hall, Vincent Sq., Westminster, London, S.W.1. (11 a.m.)

Sept. 9th.—Ministry of Civil Aviation demonstrations of technical radio equipment. More details pending.

Sept. 12th and 13th.—S.B.A.C. Flying Display and Exhibition, Handley Page Airfield, Radlett, Herts.

Nov. 15th.—Paris Aero Show, Grand Palais, Champs Elysees.

Nov. 15th.—Engineering exhibition, Kelvin Hall, Glasgow.



ON SUPERSONIC LINES: The D.H.108, designed for practical research into the problems of high-speed flight. Swept-back wings, chief feature of the 108, will doubtless appear to an increasing extent in future fighters.

SERVICE AVIATION

Royal Air Force and Naval Air Arm News and Announcements

Bomber Command Appointment

AIR VICE-MARSHAL R. M. FOSTER, C.B., C.B.E., D.F.C., has been appointed A.O.C. No. 3 Group in Bomber Command.

A.V.-M. Foster has been A.O.C. and Chief of the Air Division, Control Commission for Austria, since August, 1945, before which he had been A.O.C. Desert Air Force since December, 1944.

Redundant Aircrews to Retain Rank

THE Air Ministry announces that airmen aircrew who have been declared redundant and are now qualified in a ground trade may retain the ground equivalent of their aircrew rank for a year, drawing the appropriate pay and allowances.

After the end of the war, redundant members of aircrew remained liable for flying service and kept their aircrew conditions of service. Now, however, for the majority, no real liability of this kind can be said to remain, and on July 1st they lost their aircrew status and retained only their ground trade mustering. They may continue to wear flying brevets.

New R.A.F. Uniforms?

A COMMITTEE of Air Ministry and R.A.F. Home Command representatives, under the chairmanship of Air Marshal Sir James Robb, has been formed to consider the question of new uniforms for the R.A.F.

While no decisions have yet been made, it is believed that among the proposals examined are the abolition of officers' mess and full-dress uniforms, the introduction of a new battledress (for working and flying) and also a walking-out uniform of new design.

Demobilization

THE Air Ministry forecast of releases for August and September shows that the general level of release for ground airmen will be Group 44. Airwomen's average group will be 49.

Aircrew, both officers and airmen, will be released up to and including Group 47. The general release level for R.A.F. ground officers will be at Group 42, and for W.A.A.F. officers Group 48.

R.A.F. Benevolent Fund

TO meet changing conditions, the R.A.F. Benevolent Fund has been reorganized; a separate branch for ex-Service personnel has been set up, and the Fund now operates from a single headquarters at 67, Portland Place, W.1, where sections have been established to deal with casualties, disablement cases, ex-R.A.F. and W.A.A.F. members, and serving personnel.

During the first six months of this year the Fund assisted 620 cases a week—the highest rate in its history. It is expected that the number of R.A.F. and W.A.A.F. personnel needing help will continue to increase, due to such factors as the higher cost of living and the housing shortage.

Bombing Results

REFERENCE was made in *Flight* of May 30th to tests of deep-penetration bombs dropped by U.S.A.A.F. Superfortresses and R.A.F. Lancasters on the U-boat pens at Farge near Bremen. It has now been announced that out of twelve releases Superfortresses have obtained six hits, and that the Lancasters of No. 15 Squadron, operating at a lower level, secured five hits out of eight releases. The bombs used were of 12,000 lb and 22,000 lb.

New Officers' Association

OFFICERS of the Services who were attached to, or served at, the R.A.F. Headquarters in Northern Ireland will be eligible for membership of a new Association formed under the rather ponderous title of the H.Q.R.A.F.N.I. Officers' Association.

Released and retired officers who intend to join the Association may obtain enrolment forms from the Secretary, Sqn. Ldr. J. P. Ward, Wilmont House, Upper Malone Road, Belfast.

123 Squadron Reunion

NO. 123 (East India Fund) Fighter Squadron has now been disbanded after service in S.E. Asia Command, flying Thunderbolts.

A reunion association has been formed and the inaugural meeting and dinner will be held on August 3rd, at 6 p.m., at Gow's Restaurant, St. Martin's Lane, W.C.2.

Roll of Honour

Casualty Communique No. 593.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Of the names in this list 285 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. C. R. Anderson; Flt. Sgt. P. Ashworth; Sgt. W. G. Austen; P/O F. E. Baker; Flt. Sgt. N. P. Baker; Sgt. J. Barton; Flt. Sgt. T. L. Benson; Flt. Sgt. W. V. Bibby; F/O. D. C. Biggar; Flt. Sgt. A. W. Bishop; P/O J. C. Botting; Sgt. C. S. Bowers; W/O. D. B. Brotchie; Flt. Lt. J. S. Bruce; Flt. Sgt. A. M. Brunton; Sgt. D. Cahill; Sgt. D. Y. Carter; P/O L. Carter; F/O. C. P. Clark; Flt. Sgt. W. J. Cooper; Flt. Sgt. G. Cross; Sgt. J. W. Cross; Sgt. E. K. Day; Sgt. T. Dixon; Flt. Sgt. D. D. Duck.

TOP OF THEIR CLASS : A line of Miles Monitors awaiting delivery to the R.A.F. As the first type to be designed specifically for target-towing, the Monitor has many advantages over slower and less stable aircraft adapted for the purpose

SERVICE AVIATION

worth; Flt. Sgt. F. H. Ebbage; Flt. Lt. R. G. Elvin; W/O. J. A. Etchells; F/O. H. E. Evans; Flt. Sgt. J. J. Ferguson; Flt. Sgt. A. W. Ferme; Flt. Lt. B. K. L. Fuge; F/O. H. W. Fuller; F/O. R. V. Goldsmith; Flt. Sgt. W. J. Goodbody; Flt. Sgt. H. G. Harding; P/O. P. J. Hargreaves; Flt. Sgt. B. V. Harris; P/O. S. J. Harrop; Sgt. D. U. Hart; Flt. Sgt. H. W. G. Hart; Sgt. F. M. Harvey; Flt. Lt. S. H. Hatsell, D.F.C.; Sgt. K. R. Haw; F/O. S. C. Hawkins; Flt. Sgt. H. T. Hayes; Sgt. N. Hicks; Sqn. Ldr. M. R. Hill; Sgt. J. S. Holdcroft; P/O. L. G. Holland, D.F.M.; Sgt. K. J. Holmes; F/O. C. Horne; F/O. J. Hoyland; Sgt. F. W. Hughes; Flt. Lt. E. G. Hunt; Sgt. R. Hurley; Flt. Sgt. R. Johnson; Sgt. P. Kane; Act. Wing. Cdr. L. H. Kay, D. F. C.; Flt. Sgt. T. Kelly; Sgt. R. Kerr; Sgt. G. J. A. Kervin; Act. F/O. D. N. King; Act. Sqn. Ldr. L. F. D. King; Flt. Sgt. J. Levey; Sgt. R. Lister; Sgt. A. Lockett; Sgt. J. F. Logan; Flt. Sgt. D. J. Long; Sgt. C. A. Longstaff; P/O. K. McCall; Flt. Sgt. H. M. McClymont; Sqn. Ldr. I. MacLeod-Selkirk; F/O. J. V. McShane; W/O. F. Mahoney; Flt. Sgt. J. R. Mears; Sgt. F. Milton; Act. Wing Cdr. R. A. Mitchell, D.F.C.; Sgt. J. S. Mohun; F/O. W. S. J. Moore; F/O. D. V. Myers; Sgt. R. H. G. Nevard; Flt. Sgt. F. B. Palmer; Flt. Sgt. H. W. Parker; W/O. F. Parr, D.F.M.; Sgt. N. Peckham; Sgt. W. E. Pickering; F/O. R. C. Pitman; Flt. Sgt. A. Pringle; Flt. Lt. E. Rayner; W/O. G. C. Redmond; Sgt. K. Relton; Flt. Lt. G. S. Richardson; F/O. G. A. Robertson; Sgt. E. R. Robinson; W/O. V. A. Roe, D.F.M.; Flt. Sgt. G. F. Sage; Flt. Lt. F. C. Salt; Sgt. P. L. W. Scott; F/O. S. O. Scott; Sgt. R. Scrowther; P/O. E. F. Secar; Act. Flt. Lt. H. O. Sharman, D.F.C.; Sgt. J. Sinclair; Sgt. T. Slater; Sgt. K. J. B. Smith; Act. Flt. Lt. K. S. Smith; Sgt. H. Smither; Sgt. T. F. Stewart; Flt. Sgt. S. Stuart; Sgt. J. H. Stuart-Ritson; F/O. E. Stubbs; Flt. Sgt. W. S. H. Tandy; Flt. Sgt. G. J. Thomas; P/O. E. G. Tilby; Flt. Lt. D. P. Tough; P/O. J. Toy; Sgt. D. W. A. Udall; Sgt. E. F. Vevers; P/O. G. W. Walker, D.F.C.; Sgt. A. J. D. Wares; Sgt. C. H. Watkins; Flt. Lt. F. Watson, D.F.C.; Flt. Sgt. H. M. Watson; Flt. Sgt. R. H. Welsh; F/O D. W. Weston, D.F.C.; Sgt. W. M. Wilkinson; Sgt. E. G. Wilson; Flt. Sgt. P. Y. Yanai.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Flt. Lt. H. H. Fielding-Johnson, D.F.C.; F/O. L. G. Harbord; Sgt. L. Middleton; Act. Flt. Lt. T. C. B. Smith.

KILLED ON ACTIVE SERVICE.—A/C.1 C. Blair. L.A/C. R. K. Blanchard; F/O. M. L. M. Blankstein; F/O. J. E. W. Bott; A/C.1 J. S. Evans; A/C.1 F. H. Hall; A/C.1 B. Hickey; L.A/C. E. Lewis; L.A/C. A. Stock; L.A/C. D. W. Warwick.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Flt. Sgt. G. R. Archbold; W/O. J. E. Betton; Sgt. A. M. Forbes; Sgt. S. M. E. Fraser; Sgt. D. B. Godden; Sgt. W. T. H. Lowman.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW REPORTED KILLED ON ACTIVE SERVICE.—L.A/C. S. Morrison.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—L.A/C. J. W. Ellis; A/C.1 G. M. Tate.

DIED ON ACTIVE SERVICE.—A/C.2 H. H. Adams; A/C.1 S. W. Allan; L.A/C. F. W. Anniss; Cpl. D. W. Barber; Cpl. L. G. Bishop; A/C.1 R. Bissett; A/C.1 R. Cliff; L.A/C. P. W. Cole; Cpl. P. R. Constable; L.A/C. J. Coombs; A/C.1 R. E. Cossens; A/C.1 J. H. Darnell; Cpl. D. B. Dawson; Cpl. D. I. Dixon; Cpl. R. N. Dunne; L.A/C. W. V. Dyer; Cpl. F. C. Edwards; Cpl. S. L. Evans; Cpl. N. Fenn; Cpl. J. F. Fenwick; A/C.1 F. Fleming; A/C.1 E. Foster; Cpl. G. H. Frank; L.A/C. W. Harling; A/C.2 D. J. Harris; Sgt. H. G. Hatton; A/C.1 C. Hawkins; A/C.2 P. G. Hayward; L.A/C. G. T. E. Hazlehurst; Cpl. C. E. Healam: Act. Cpl. R. N. Holmes; L.A/C. E. Horrobin; A/C.2 A. Jacobs; L.A/C. M. James; A/C.2 W. Jenkinson; Cpl. W. J. Jess; Cpl. G. Jones; L.A/C. G. H. Kent; L.A/C. C. N. Loveridge; Cpl. W. H. Lucas; Cpl. E. A. Marsh; L.A/C. A. R. Orson; Flt. Sgt. H. T. Parker; L.A/C. J. E. Saward; W/O. H. O Scarsbrook; Wing/Cdr. E. B. Steedman: L.A/C. F. Vasey; A/C.1 T. H. Williams; L.A/C. A. W. Willmoth; Cpl. T. Young.

SINGAPORE TERMINAL : Air Marshal Sir Keith Park recently opened Changi airfield at Singapore—largest in the Far East. No. 5353 Construction Wing of the R.A.F. started work on the airfield last January ; the main runway, 2,000yd long and 50yd wide, has already been completed. Japanese P.o.W. labourers are shown, employing an improvised method of bending pierced steel planks.

Women's Auxiliary Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—L.A/CW. J. P. Metherell.

Royal Australian Air Force

MISSING, NOW PRESUMED KILLED IN ACTION.—Act. F/O. W. S. Degaris.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. B. A. S. Abbott; W/O. A. D. Anderson; P/O. R. O. Bailey; Flt. Sgt. F. J. Bean; Flt. Sgt. N. C. Boyd; F/O. H. J. Brock; Flt. Sgt. M. B. Bruckner; F/O. M. Callas; P/O. J. H. Carter, D.F.M.; Flt. Sgt. P. J. Carter; F/O. K. A. Cook; P/O. L. P. Curtin; W/O. E. J. Datson; Flt. Sgt. R. R. Denholm; P/O. S. G. De Vis; F/O. V. Dunn; Flt. Sgt. F. E. Everatt; P/O. A. N. Fletcher; Act. Wing Cdr. W. A. Forbes, D.S.O., D.F.C.; F/O. C. C. Gibson; W/O. R. D. Gill; Flt. Sgt. A. E. Gillespie; Flt. Sgt. J. D. Gloury; P/O. K. Gowlett; P/O. F. G. Grey; Flt. Sgt. J. W. Grice; Flt. Sgt. R. Hardy; Act. F/O. C. S. Hart; Act. F/O. K. G. Hollaway; F/O. L. M. Hough; Flt. Lt. W. G. Huddart; Act. F/O. J. M. Inkster; W/O. W. A. Kinloch; F/O. G. M. Lumsden; Flt. Sgt. B. C. MacKnight; F/O. E. H. McDonald; P/O. A. A. McGrath; F/O. H. J. A. McLean; Flt. Sgt. J. E. B. MacLean; F/O. A. J. McMahon; Flt. Sgt. M. J. McNamara; F/O. W. A. McNamee; Flt. Lt. C. Mapletoft; Act. Flt. Lt. W. H. P. Mitchell; W/O. R. W. Moffatt; P/O. J. R. Mulligan; P/O. K. G. Munro; P/O. H. S. Nickless; Flt. Sgt. G. J. P. O'Brien; Act. F/O. C. D. Pauline; P/O. A. H. Pearce; Act. F/O. W. N. R. Pearce; P/O. A. J. Perkins; F/O. A. F. Rowe; Flt. Sgt. L. J. Saulwick; P/O. R. S. Seaman, D.F.M.; Flt. Sgt. S. Servos; P/O. J. R. Shepley; F/O. B. G. Sherry; Act. F/O. K. V. Smith; P/O. J. E. Stanton; Flt. Sgt. E. T. Summerson; W/O. B. D. Tovey; W/O. B. F. Weber; W/O. R. Webster; Flt. Sgt. F. H. Wilkins; Flt. Sgt. H. J. Williams; W/O. A. E. Wood; F/O. G. C. Yorkston.

KILLED ON ACTIVE SERVICE.—Sgt. D. J. Gosbell.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Flt. Sgt. C. E. H. Barnfield; F/O. G. Fong; Flt. Sgt. D. R. Keast; Flt. Sgt. A. A. Robins; Flt. Sgt. N. G. Sandlant; Flt. Sgt. A. B. Tunnock; F/O. A. H. Williams.

Royal Canadian Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. J. W. Blades; F/O. R. J. L. Boucher; F/O. C. P. Boyle; F/O. F. C. Bremner; P/O. G. W. Brooks; F/O. S. V. Chambers; P/O. R. H. Chittim; F/O. J. H. Clark; Flt. Lt. W. M. Constable; Flt. Lt. W. D. Corbett, D.F.C.; F/O. J. A. E. T. Cousineau; Flt. Sgt. H. Cuthbertson; P/O. E. L. Davis; P/O. H. J. M. J. D'Avril; F/O. J. J. A. L. Desbiens; Flt. Sgt. W. W. Dewar; P/O. W. S. Dickson; F/O. H. R. Dryer; F/O. H. J. Feldhans; P/O. J. L. Gallant; W/O. R. W. Gibson; P/O. A. N. Gould; P/O. H. R. Harris; P/O. L. W. Harvey; F/O. D. K. J. Hector; P/O. D. A. Henderson; P/O. K. B. Hicks; P/O. J. W. Hickson; Flt. Lt. H. M. Hope; P/O. F. L. Jolicoeur; P/O. E. R. Kaesmodel; Flt. Lt. J. G. Kirkpatrick; F/O. G. E. Langille; P/O. J. A. H. Larson; P/O. J. T. J. Magee; P/O. K. A. Miller; P/O. J. R. Morin; F/O. M. R. F. Olivet; P/O. L. J. Parent; F/O. N. Peters; P/O. A. C. Pettifor; F/O. J. H. Quirt; Flt. Sgt. W. J. Rahkola; P/O. A. E. Rheubottom; Flt. Lt. R. C. Ridge, D.F.C.; F/O. C. J. Rouse; Flt. Lt. A. G. Rowe, D.F.C.; P/O. L. A. Russell; F/O. J. L. M. R. Savard; Sgt. R. R. H. Schnaufer; P/O. N. L. W. Scott; P/O. R. D. Scott; F/O. H. Smook; W/O. H. A. Stephen; F/O. R. E. Stillinger; P/O. L. S. Tobin; W/O. J. J. M. Tremblay; P/O. G. N. Ware; Flt. Lt. J. Waslyk; F/O. L. G. Watson; F/O. G. T. Weiss; Flt. Sgt. A. E. Wells; P/O. R. T. Wilson; F/O. V. H. Wilson.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. C. N. Flette.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. K. Jackson; F/O. G. Stewart; P/O. J. W. Winstone